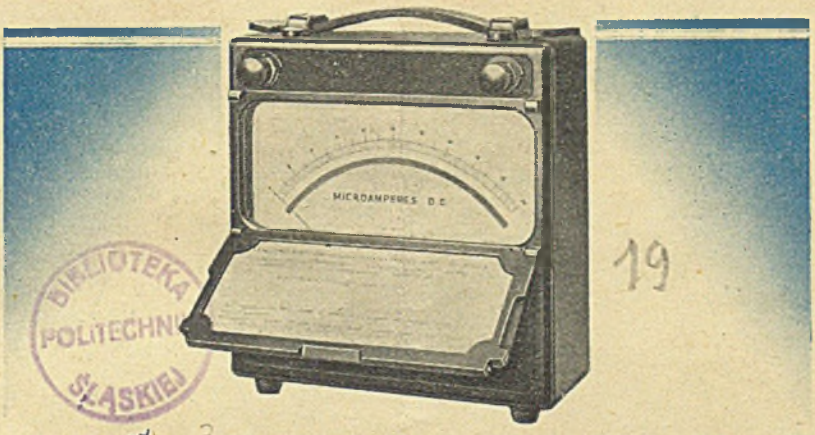
24 48 II cz.1
THE P.60 47 II

THE ELECTRICIAN

THE TECHNICAL NEWSPAPER OF THE ELECTRICAL INDUSTRY



BIBLIOTEKA POLITECHNI SLASKIEJ

19

K-27 3

New Portable Instruments

These new Weston Model S82 portable instruments represent a notable achievement in modern instrument design and technique. An outstanding feature is that they can be supplied with Sub-standard accuracy for ranges down to 5 microamps and 1 millivolt. With this extreme sensitivity, they also couple robust construction so that they will withstand severe service conditions. The instruments have 6 inch scales, knife edge pointers, anti-parallax mirrors and neat bakelite cases. Please ask for details.

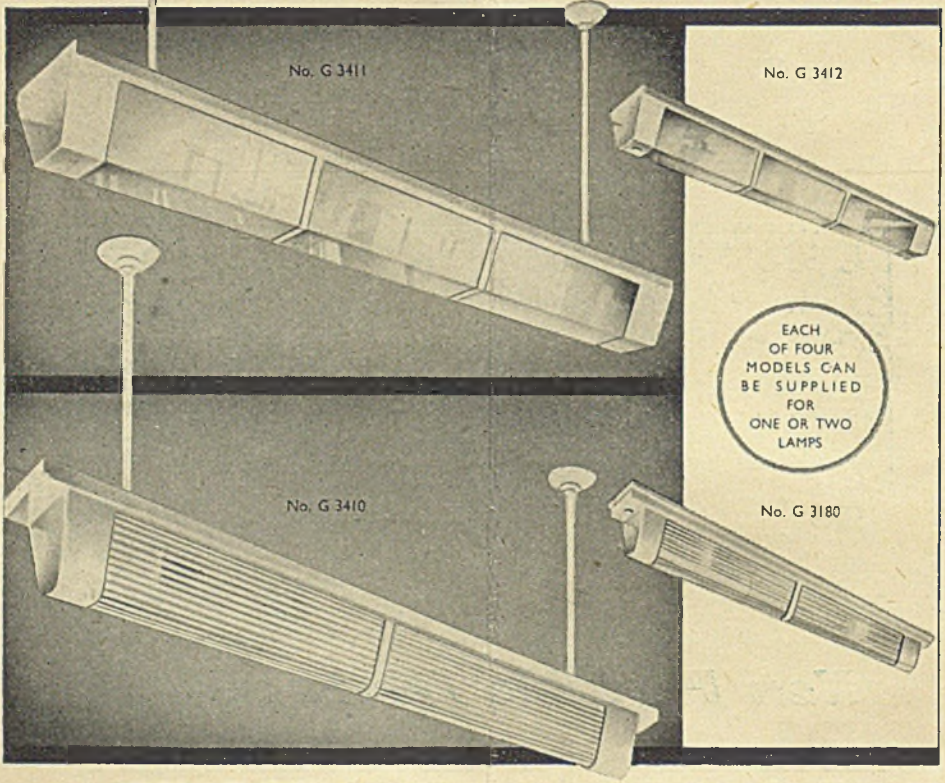
SANGAMO WESTON LIMITED

GREAT CAMBRIDGE ROAD ENFIELD MIDDLESEX

Telephone: Enfield 3434 & 1242

18 JULY 1947
SIXPENCE

NEW *Totally Enclosed* FLUORESCENT *Fittings*



GEORGE FORREST & SON LIMITED

Designers and Manufacturers of all types of Tungsten and Fluorescent Decorative Lighting Fittings.

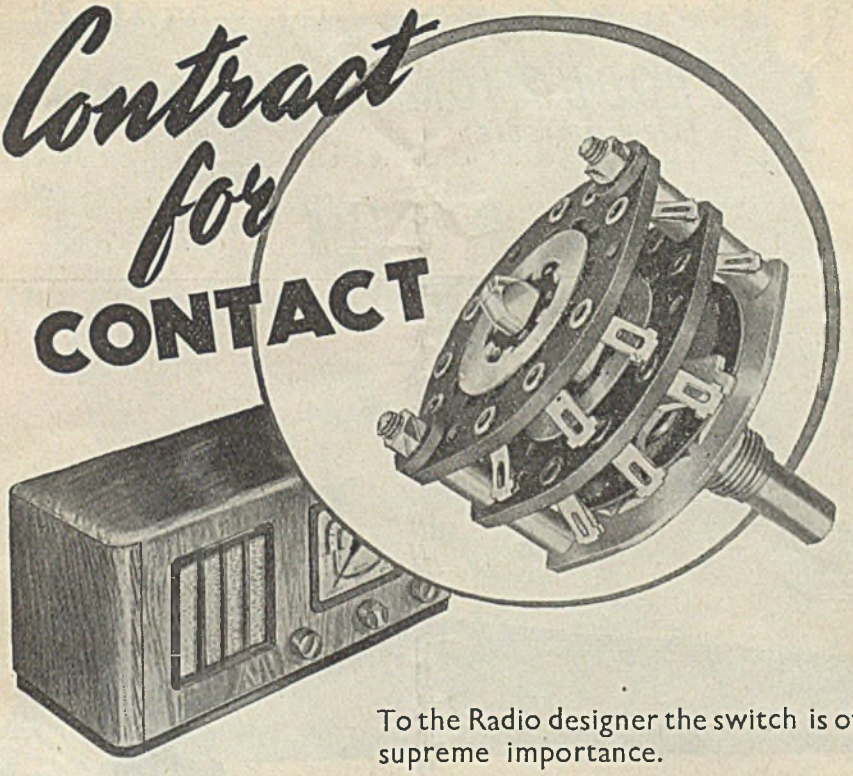
The fittings illustrated have control gear built in for easy access, the pendants being arranged to provide some ceiling illumination. Illustrated leaflet on request.

OSBORNE RD., ACTON, LONDON, W.3.

TELEPHONE ACORN 5081 (5 lines).
TELEGRAMS: GEFSOL EALUX LONDON

ESTABLISHED 1780

Contract for CONTACT



To the Radio designer the switch is of supreme importance.

Flexibility of design for easy wiring and switching of complicated circuits, low contact resistance, low inherent capacities, sturdy construction—these are the features he requires.

A.B. **OAK** H Switches embody these necessary characteristics; the wise manufacturer would be well advised to fit A.B. Switches—the last word in reliability.

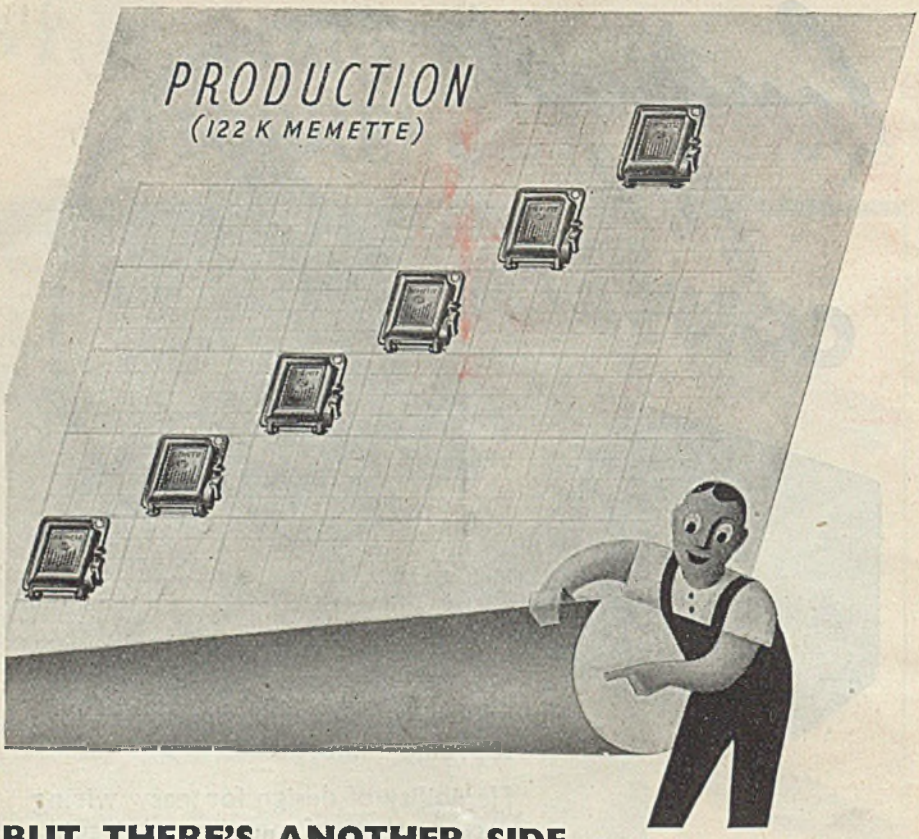
All A.B. **OAK** *H Switches are manufactured under Patent Nos. 478391, 478392*

METAL PRODUCTS LTD.

GREAT SOUTH WEST RD., FELTHAM, MIDDX.

Telephones : Hounslow 6256. Feltham 2865

New Era



BUT THERE'S ANOTHER SIDE TO THIS PICTURE

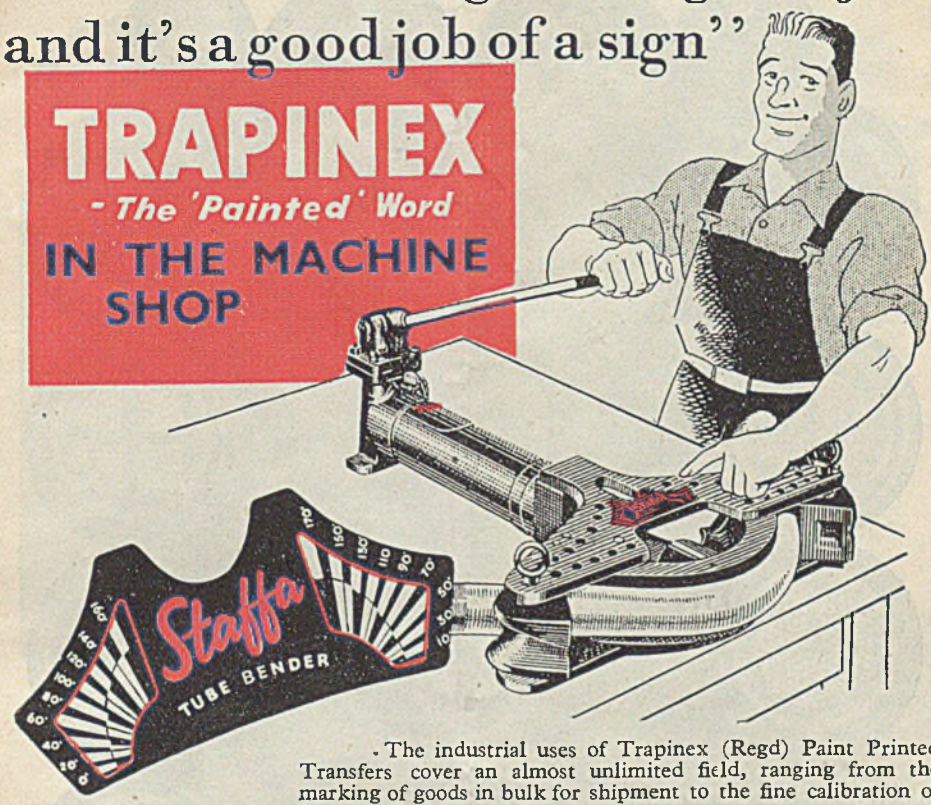
The all-out production drive at MEM is showing substantial results. In the last six months we stepped up output of 122K Memette by 50 per cent. Other MEM lines are also being produced in greatly increased quantities. Why then, you may well ask, are supplies still so difficult to obtain? That's where the other side of the picture comes in. Tremendous demands are being made on the MEM factory output for housing and industrial requirements. Demand is still greater than supply. It is still the best plan to keep in touch with your wholesaler as this growing volume of MEM goods makes itself felt. You will be certain, then, of a fair share of such supplies as are available.

MEM Switch, fuse and motor control gear, electric fires and localised lighting equipment

Midland Electric Manufacturing Co. Ltd., Birmingham, 11 · Branches in London & Manchester

"Here's the sign of a good job and it's a good job of a sign"

TRAPINEX
- The 'Painted' Word
IN THE MACHINE SHOP



The industrial uses of Trapinex (Regd) Paint Printed Transfers cover an almost unlimited field, ranging from the marking of goods in bulk for shipment to the fine calibration of intricate machinery.

Commercial Structures Ltd., use Trapinex Transfers on a variety of products including the Tube Bender illustrated; in this instance, for the scales showing the angle of the bend, together with their own trade mark.

Trapinex Transfers are equally easily applied to glass, wood, plastics, or any smooth surface. Produced in special paint many times brighter than ink, they offer brilliant colour effects in any number of colours together with bold relief and cut out design. No film or paper background mars the distinctive effect. Brilliant, durable, weatherproof and easy to apply.

Advice freely given, but when you write for prices please state (1) Size, (2) Quantity, (3) Number of colours, (4) Purpose, (5) Wording required, (6) A rough sketch would help. *WE HAVE NO STOCK LINES OR PRICE LISTS.*

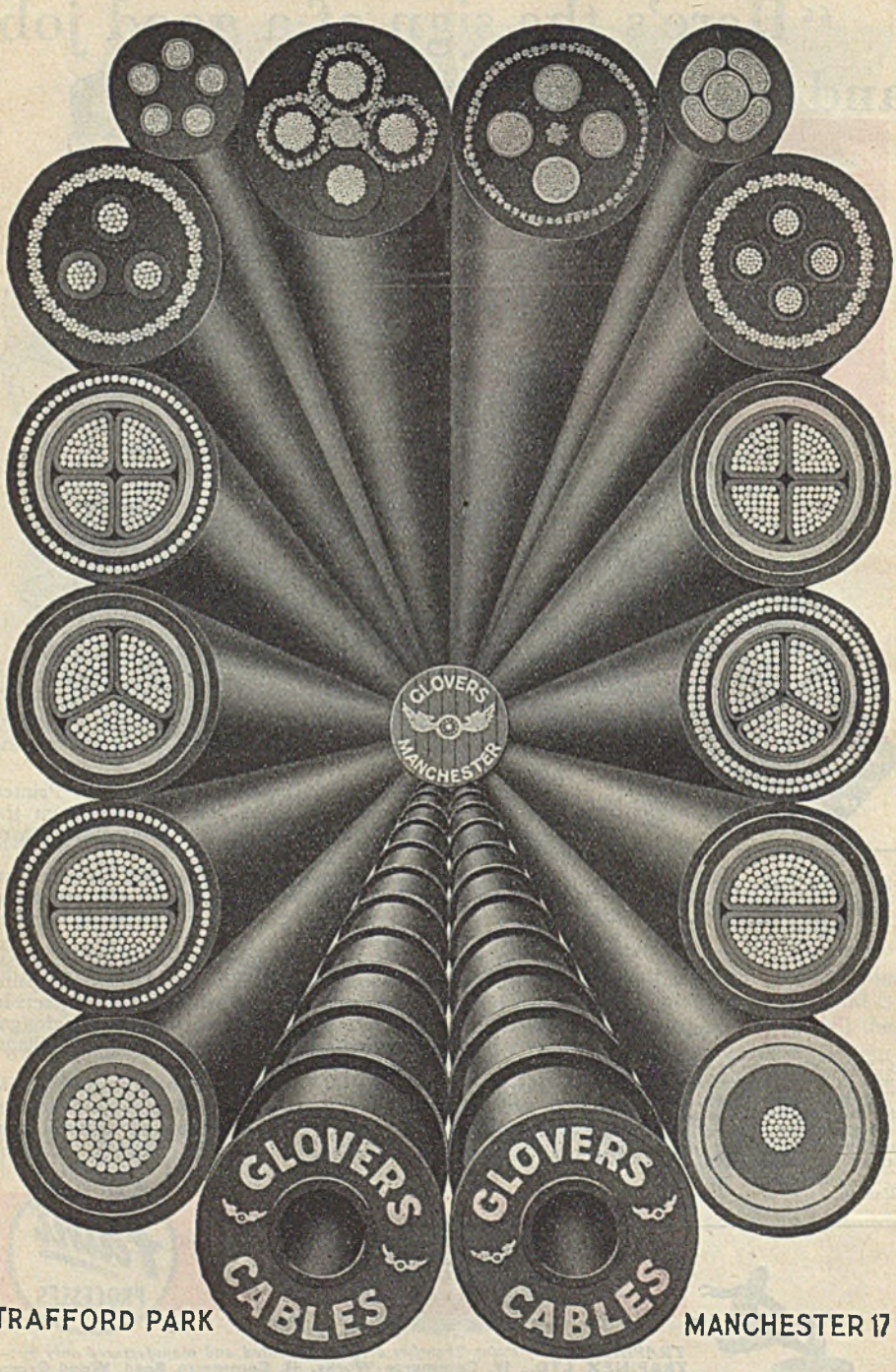
The Perfect Link-up
VAN & WINDOW PUBLICITY

Staffa

C.S.Ltd. among many other manufacturers, also use large Trapinex Paint Transfers for their delivery vans and other publicity purposes including brilliant cut out effect on shop windows. This ensures the perfect link up.

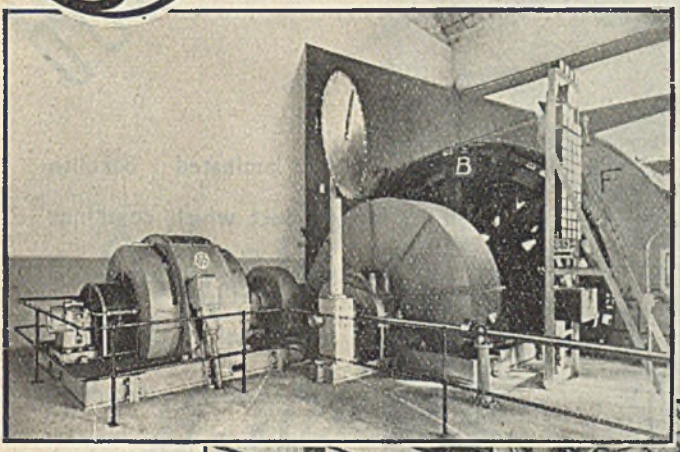
TRAPINEX Paint PROCESSES

TRAPINEX (regd.) Paint Transfers are fully patented and manufactured only by:—
TRAPINEX LTD., 19, Commerce Works, 43, Commerce Road, Wood Green, London, N.22
Phone: Bowes Park 6811 Grams: Trapinex, Wood, London Cables: Trapinex, London



TRAFFORD PARK MANCHESTER 17

B T-H Electric WINDING EQUIPMENT

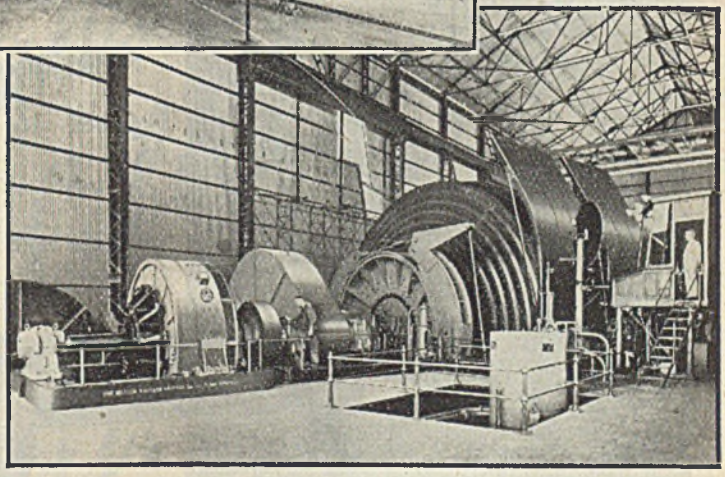


A.C. EQUIPMENT at a SCOTTISH COLLIERY

Designed for winding 305 long tons per hour from a depth of 1,845 ft.

Motor : 1,950/3,900 H.P. 423 r.p.m. 6,600 volts.

Control : Reversing Contactors Liquid Controller



WARD-LEONARD EQUIPMENT at a SOUTH AFRICAN GOLD MINE

Designed for winding 225 short tons per hour from a depth of 6,000 ft.

Motor: 2,938/7,345 H.P. 200 r.p.m.

Flywheel Motor Generator Set with BTH commutator type slip regulator

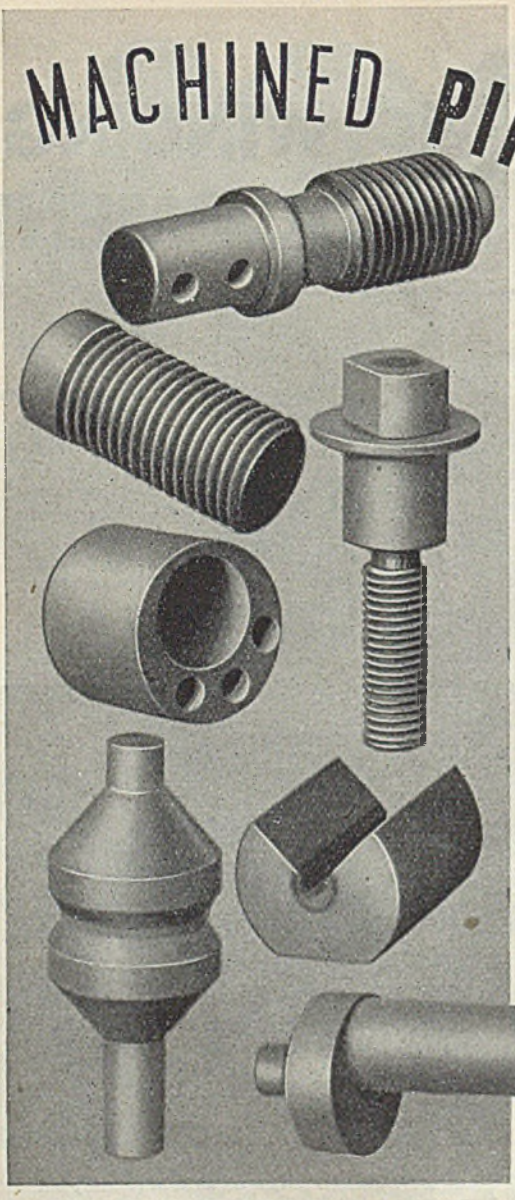
BTH products include all kinds of electric plant for service ABOVE or BELOW GROUND

BTH RUGBY

THE BRITISH THOMSON-HOUSTON COMPANY LIMITED, RUGBY, ENGLAND. A 3703

AEI

MACHINED PIRTOID ROD



A laminated bakelite product which combines high electrical and mechanical properties with ease of machining. Manufactured in various grades to suit every purpose. Write for Catalogue No. P/44.

H. CLARKE & CO.,
(MANCHESTER) LTD.
PHONE : ECCLES 2001 - 2 - 3 - 4 - 5
GRAMS : Pirtold, Phone, Manchester

ATLAS WORKS
PATRICROFT
MANCHESTER

"Lecupler" regd.

The complete system of Bolted Flame-proof Cable Couplers

& Stock Deliveries

FLP

Write for Booklet Ref. L.E.C./M.101.

LEC

THE LIVERPOOL ELECTRIC CABLE COMPANY LTD

LINACRE LANE • BOOTLE • LIVERPOOL • 20

G40

1,509,600 CUSTOMERS!

The estimated number of electric cookers in service indicates YOUR potential market for SIMMERSTATS!

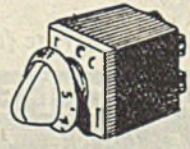
The SIMMERSTAT (retail 21/-), fitted in place of the usual 3-heat or 4-heat hot-plate switch, MODERNISES any cooker, providing PERFECT SIMMERING control.

Every housewife that cooks by electricity is a potential customer. Write now for Trade Terms for immediate delivery to:

SUNVIC CONTROLS LTD.
STANHOPE HOUSE, KEAN ST., LONDON, W.C.2
Phone: TEMple Bar 8202

The SIMMERSTAT

The *all-heat* HOTPLATE CONTROL



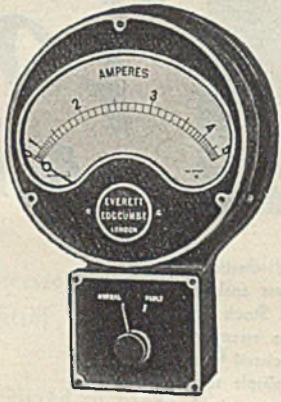
TAS/SC. 119

ONE FOR ALL
BASIC STOCK PANEL
Standardisation of internal fitments enables one Basic Stock Panel to be assembled for any circuit 1 to 8 . . . . and simple reconversion from one circuit to any other circuit ON SITE
1 & 2 Feeder or Transformer
3 & 4 Busbar Metering
5 to 8 Busbar Sectionalising
Range of Isolators also available
Air-Insulated
CLASS 5 LA SWITCHGEAR
with oil circuit-breakers
3·3 kV to 11 kV up to 150 MVA
REYROLLE
HEBBURN
CO. DURHAM, ENGLAND

IN THIS ISSUE

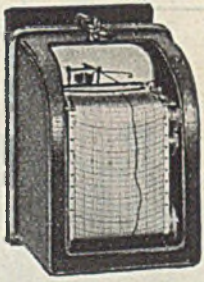
A.B. Metal Products, Ltd. 149
Aerialite, Ltd. 160
Automotive Engineering Co., Ltd. (The) ... 221
Barries Electrical Agencies, Ltd.... 223
British Broadcasting Corporation 175
British Cork Mills, Ltd. 182
British Thomson-Houston Co., Ltd. 153
Cables & Plastics, Ltd. 174
Castle Engineering Co., Ltd. (The) 176
Churchill, H. & D., Ltd. 173
Clarke, H., & Co., Ltd. 154
Cobb, H. J., & Sons 223
Cooper Mnfg. Co. 174
Cornercroft, Ltd. 176
Crane, Walter, Ltd. 223
Critchley Bros., Ltd. 170
Cuxson, Gerrard & Co., Ltd. 164
Dorman & Smith, Ltd. 177
Drayton Regulator & Instrument Co., Ltd. ... 174
D.S. Plugs, Ltd. 159
Duratube & Wire, Ltd. 168
Electricity Services, Ltd. 223
Electrolux, Ltd. 213
Electro Plastics, Ltd. 183
Electro Power Service Co. 183
Enthoven, H. J., & Sons, Ltd. 220
Ericsson Telephones, Ltd. 160
Everett Edgcumbe & Co., Ltd. 158
Forrest, George, & Son, Ltd. ... ... Cover ii
General Electric Co., Ltd. 163
Glover, W. T., & Co., Ltd. 152
Hi-Craft Electrical Products, Ltd. 169
Hinton, Jack (Electrical), Ltd. 218
Hotray Wires, Ltd. 183
Hurlock, Wm., Jnr., Ltd.... 222
Imperial Chemical Industries 224
Jones, Samuel, & Co., Ltd. 220
Kent Bros., Electric Wire Co. & E. H. Philips Ltd. 167
Kent, Wm. (Porcelains), Ltd. 177
Lewis, H. K., & Co., Ltd. 183
Litholite Insulators & St. Albans Mouldings, Ltd. 170
Liverpool Electric Cable Co., Ltd. 155
Londex, Ltd. 168
Lundberg, A. P., & Sons, Ltd. 162
Lyons, Claude, Ltd. 162
Macbean, Ed., & Co., Ltd. 166
Metropolitan Vickers Electrical Co., Ltd. Cover iv
Micramatic Electrical Instruments Co., Ltd. ... 183
Midland Electric Manufacturing Co., Ltd. ... 150
Mosses & Mitchell, Ltd. 222
Multicore Solders, Ltd. 174
Nalder Bros. & Thompson, Ltd.... 217
Nife Batteries, Ltd. 183
Nottingham Thermometer Co., Ltd. (The) ... 222
Peace, Harold E., & Co., Ltd. 166
Penny & Porter (1932), Ltd. 183
Pitman, Sir Isaac, & Sons, Ltd. 218
Proved & Producing Properties, Ltd. 219
Record Electrical Co., Ltd. (The) 218
Reyrolle, A., & Co., Ltd. 157
Roneo, Ltd. 161
Rowlett Engineering Co., Ltd. 167
Salter, George, & Co., Ltd. 168
Sangamo Weston Ltd. ... ... cover i
Santon, Ltd. 215
Scemco, Ltd. 223
Scholes, George H., & Co., Ltd.... 166
Scophony, Ltd. 172
Stainless Steel Wire Co., Ltd. 172
Sunvic Controls, Ltd. 156
Symonds, R. H., Ltd. 159
Telco, Ltd. 172
Transformer & Electrical Co., Ltd. 223
Trapinex, Ltd. 151
United Ebonite & Lorival, Ltd. 165
Universal Tools, Ltd. 170
Wades (Metal Spinners), Ltd. 220
Walker Crosweller & Co., Ltd. 222
West Insulating Co., Ltd.... 218
Westinghouse Brake & Signal Co., Ltd. Cover iii
Whiteley, B. S. & W., Ltd. 171
Wiggin, Henry, & Co., Ltd. 168
Wilcox, Ed., & Co., Ltd. 164
Zenith Electric Co., Ltd. (The) 164

EARTH FAULT INDICATION



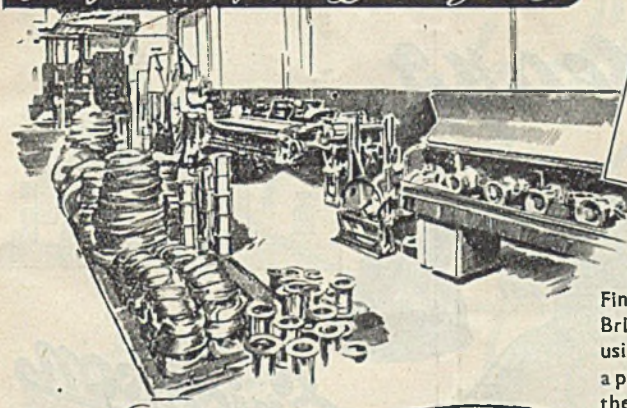
Everett Edgcumbe

Colindale Works,
LONDON, N.W.9
Telephone : Col. 6045



EVERETT EDGCUMBE SUPERSCALE LEAKAGE INDICATORS AND RECORDERS are available for three-phase earthed systems—where the neutral point is accessible or inaccessible—two-phase—single-phase—and all D.C. systems. An outstanding feature is the low range which facilitates the detection and removal of faults in the early stage of development.

The Process of Wire Drawing (No 3)



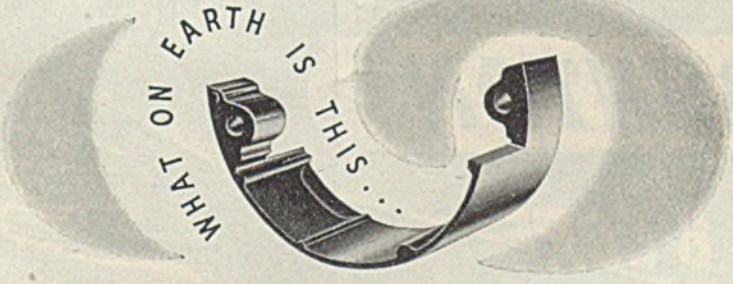
Fine Wire DRAWING

Fine copper wire is drawn on British high speed machinery using Diamond dies, thus ensuring a perfect finish and gauge, to meet the most exacting specifications.

R. H. SYMONDS Ltd.

47 Victoria Street, Westminster, LONDON, S.W.1
Telephone: ABBey 2771 (Pte. Br. Ex.)
Works: Enfield, Middlesex.

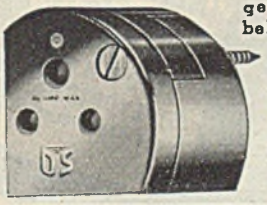
E32.



The rather rummy looking object above is one section of the new DS skirt for surface mounting the DS conduit box type socket. The other section is an absolute twin, and they get together as shown below.

This enables the skirt to be fixed after the wiring has been completed and means greater ease for the wireman.

Just another ingenious addition to the DS Fused Plug and Socket range.

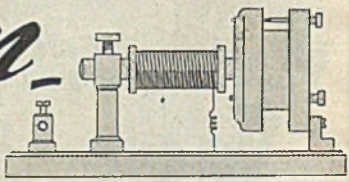


DS

FUSED PLUG AND SOCKET

Announcement of DS Plugs Ltd., Manchester - London - Glasgow. EIM47

70 Years on



Ericsson

TELEPHONES LTD.
22, LINCOLN'S INN FIELDS
W.C.2

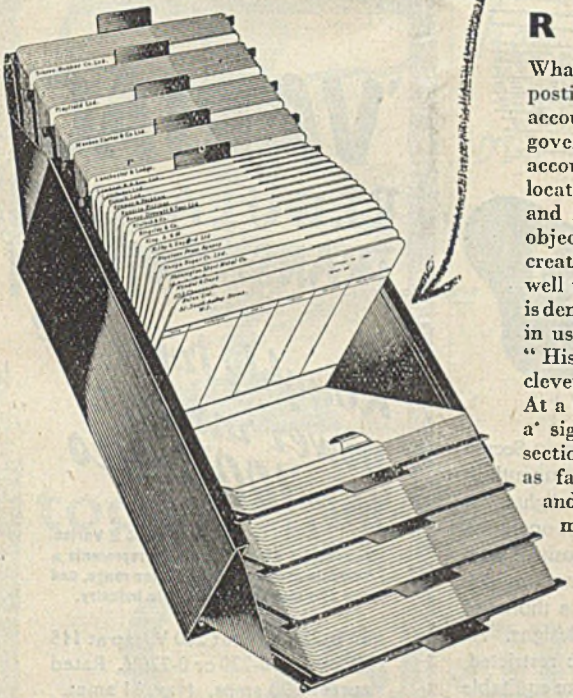
"ASHTON"

8 CORE
TOUGH RUBBER
SHEATHED CABLE

TO C.I.E.S.S. REQUIREMENTS
As supplied to H.M. Government Departments
In T.R.S. and P.V.C. (Plastics)

Made by
AERIALITE
LIMITED
CASTLE
WORKS,
STALYBRIDGE,
CHESHIRE-ENGLAND

A quick flick AND PICK!



RONEOTOL

Whatever method of mechanical posting is used, the output of the accounting machine is largely governed by (a) *ease* of handling the account cards, and (b) *speed* in locating and replacing them. Ease and speed were therefore the chief objects of the Roneo designers in creating the Roneotol System. How well they have provided the answer is demonstrated by every installation in use. The cleverly spring-loaded "History" cards and the equally clever Rocking Guides are the secret. At a touch the cards fan out, giving a sight of every account in the section. Individual cards are offered as fast as they can be extracted and speed is limited only by the manual dexterity of the operator. Replacement is equally simple — and equally fast. The correct location of every returning card is immediately visible and the risk of misfiling is virtually eliminated.

RONEOTOL MACHINE LEDGER POSTING EQUIPMENT

call in RONEO *and do the job properly*

RONEO LTD · 17 SOUTHAMPTON ROW · LONDON W.C.1 · Tel: Hol. 5821: Works, Romford, Essex

Branches throughout the country

CAN YOU KEEP IT DARK?

Of course, you can! The LUNDBERG Secret-key Tumbler Switch ensures that no unauthorised person can tamper with your lights. A specially designed turn-key prevents operation by nail-files, pen-knives, etc., a positive safeguard found only in this LUNDBERG model. This switch is only one of nearly a thousand LUNDBERG specialised accessory designs. As with all good things, supplies are restricted, but we are doing our best to ensure equitable distribution

LUNDBERG

REG^{D} TRADE MARK

LEKTRIK

A TI COMPANY

A P LUNDBERG & SONS LTD (Established 1882)
491-493 Liverpool Road London N7

The new type 50B

'VARIAC' REGULATING TRANSFORMERS

Roughly triple the power rating of the '100' Series

The Type 50 B Variac, handling 7 kVA at 230 V in, represents a valuable addition to the Variac range, and will find many applications in industry.

50 B 7kVA Input 230 V (tap at 115 V), output 0-230 or 0-270V. Rated current 20 amps. Max. 31 amps.

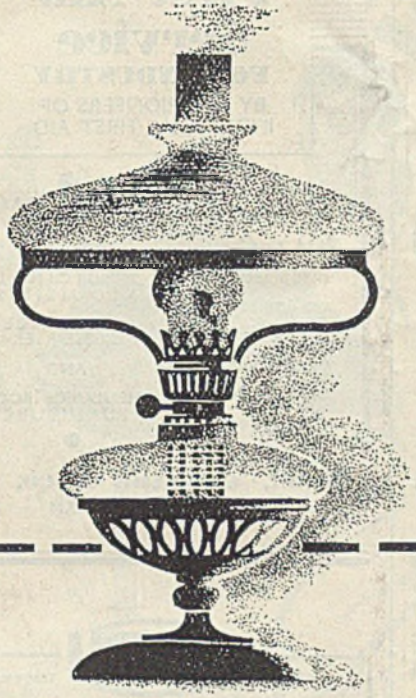
Excellent deliveries can be arranged. Most types are in stock. Other Variac types range from 165 watts to 7 kW. Write for bulletin 424 E and circular 146 E for complete data.

Claude Lyons LTD

ELECTRICAL AND RADIO LABORATORY APPARATUS ETC

180 Tottenham Court Road, London, W. 1
and 76, Oldhall Street, Liverpool, Lancs.

THE MARCH OF LIGHT



Mrs Beeton had to light her kitchen by oil lamps . . .

today there's

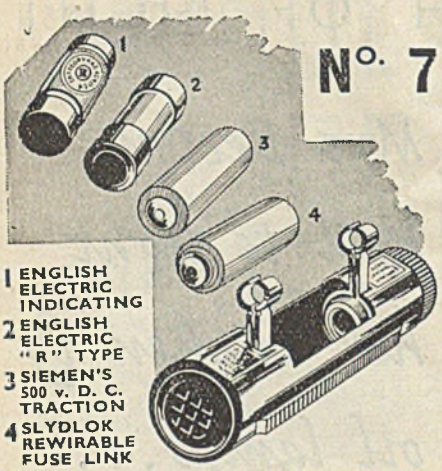
Osram

the wonderful lamp

A G.E.C. PRODUCT

Advt. of The General Electric Co. Ltd., Magnet House, Kingsway, London, W.C.2.

Fusing Facilities



N°. 7

1 ENGLISH ELECTRIC INDICATING
2 ENGLISH ELECTRIC "R" TYPE
3 SIEMEN'S 500 v. D. C. TRACTION
4 SLYDLOK REWIRABLE FUSE LINK

SIMPLIFIED ADAPTABILITY

The larger sizes in the New SLYDLOK Fuse range provide four alternative degrees of protection, from 250ACDC3, using the standard SLYDLOK rewirable Fuselink (at the cost of a fuse wire,) to 500ACDC4, using one of three proprietary makes of H.R.C. cartridges, as sketched above, all without change of holder.

Lower, but not higher, rated cartridges may be inserted in each respective size fuseholder and, equally important, neither can be inserted or used in the base without the other.

EXCLUSIVE TO THE NEW

SLYDLOK

The fuse you will eventually use

EDWARD Wilcox & Co. Ltd.

Sharston Road, Wythenshawe, Manchester.

dm E.W. 13

A Complete

First Aid Service

FOR INDUSTRY

BY THE PIONEERS OF INDUSTRIAL FIRST AID

As pioneers of Industrial First Aid, and actual manufacturers, we invite your enquiries and place our expert advice at your service.

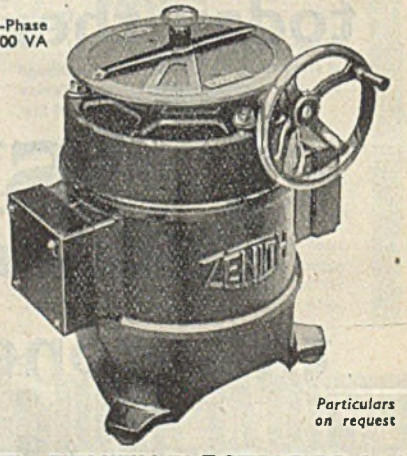
FIRST AID CASES
SURGICAL DRESSINGS
MEDICINAL REQUISITES
AMBULANCE SUNDRIES
AND
AMBULANCE ROOM FURNITURE

CUXSON, GERRARD & CO. LTD.
OLDBURY, BIRMINGHAM

REGISTERED **ZENITH** TRADE-MARK

PHASE SHIFTING TRANSFORMER

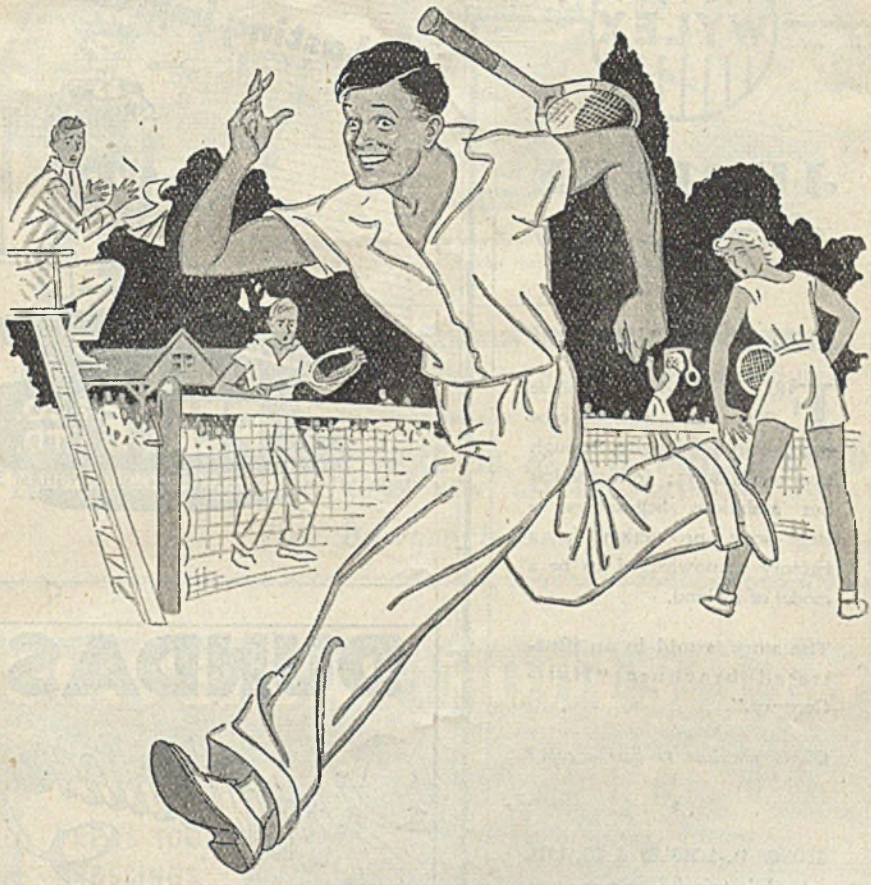
3-Phase 600 VA



Particulars on request

The ZENITH ELECTRIC CO. Ltd.
Zenith Works, Villiers Road, Willesden Green
London, N.W.2.
Phone: WILlesden 4087-8-9 *Grams:* Voltaohm, Phone, London

YOU CAN'T STOP A MAN WITH A GOOD IDEA



"Came at me like a cannon ball — the idea that it can be made in rubber. Must speak to Lorival about it!"

RUBBER OR PLASTICS?

★ *While each material possesses its own characteristics, in many applications one is as suitable as the other, and in these times of scarcity it is as well to have this in mind. Firms in need of components, complete articles or packaging should seek our advice, which is based upon wide experience and specialized knowledge. We produce articles in rubber and ebonite as well as plastics, and our service includes design and manufacture.*

LORIVAL PLASTICS

UNITED EBONITE & LORIVAL LIMITED

LITTLE LEVER, NEAR BOLTON, LANCS

WYLEX

JUBILEE
1897 — 1947

HALF-CENTURY

FROM the days of horse 'buses and hansom cabs and Britain-by-gaslight; through two world wars; from modest but ambitious beginnings to large-scale production in a Factory acknowledged to be a model of its kind.

The story is told in an illustrated brochure "Half-Century."

Would you like to have a copy?

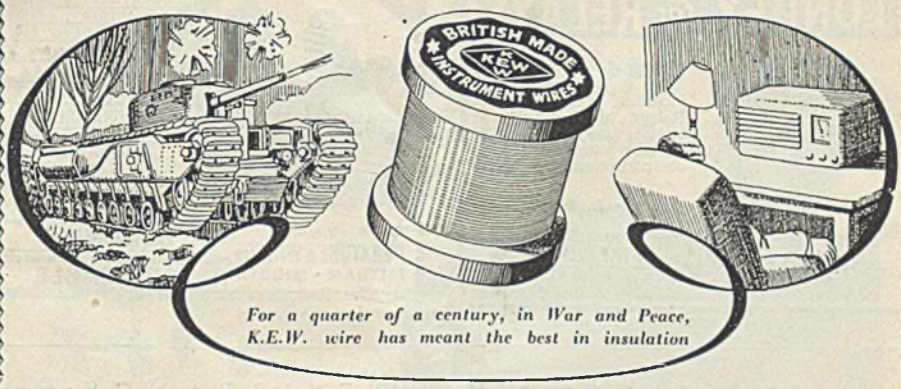
•

GEORGE H. SCHOLES & CO. LTD.
Electrical Engineers and Manufacturers
WYLEX WORKS
WYTHENSHAWE
MANCHESTER

•

WYLEX
ELECTRICAL ACCESSORIES

"Wylex must be good"



For a quarter of a century, in War and Peace, K.E.W. wire has meant the best in insulation

If you require Cotton, Silk or Enamel covered copper wires . . .

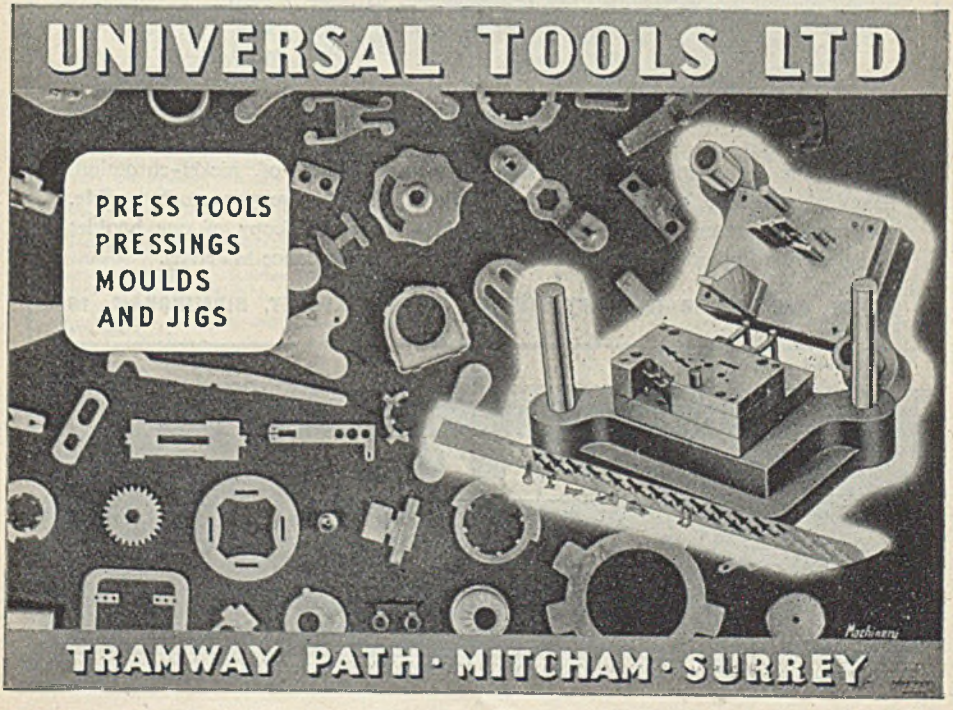
'Phone : **Prospect 1032** (3 lines). *Wire :* **"Encosil, Richmond, Surrey"**

or Write to :

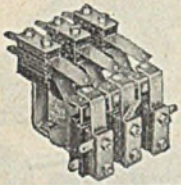
KENT BROS. ELECTRIC WIRE CO. & E. H. PHILLIPS LTD.

KEW WORKS, MORTLAKE ROAD, KEW GARDENS, RICHMOND, SURREY

Our Byword is Service



LONDEX for RELAYS



for A.C. and D.C.

including time delay Relays, high sensitive Relays, synchronous process timers and complete control plants.

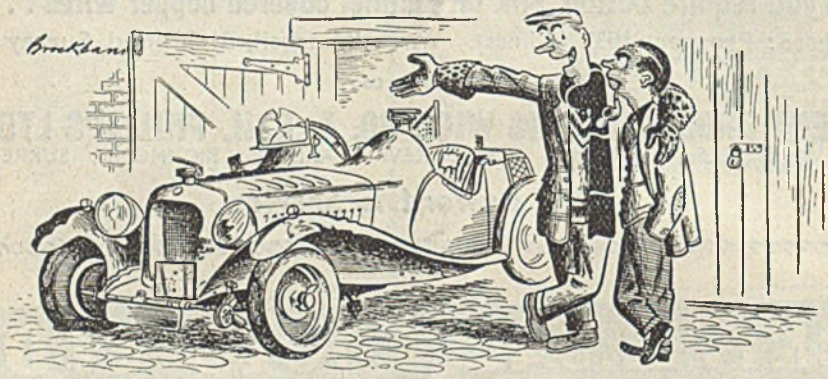
Ask for leaflets RE/E

LONDEX · LTD SYDenham 6258-9
MANUFACTURERS OF RELAYS
207 · ANERLEY ROAD · LONDON · S.E.20

DURATUBE
DURASTRIP
DURASLEEVE
DURATWINTAPE
DURATWINFLEX
DURATHREEFLEX
DURATHREECABLE
DURATWINCABLE
DURATWINFLAT
DURATHREEFLAT
DURAWIRE
DURACABLE

Sole Manufacturers:
DURATUBE & WIRE LTD
FELTHAM · MIDDSX

A QUESTION OF RESISTANCE



Sales Resistance

—often one of the most tiresome forms. Electrical resistance, on the other hand, need not be tiresome, especially if you investigate the properties of the well-known Brightray series of nickel-chromium alloys. It will save you much trouble. Write for a free copy of our booklet 'Electrical Resistance Materials.'

HENRY WIGGIN AND COMPANY LIMITED, WIGGIN STREET, BIRMINGHAM, 16

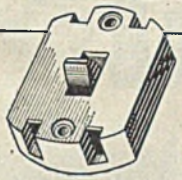
4B/W/4

SALTER SPRINGS

GEO. SALTER & CO. LTD., WEST BROMWICH

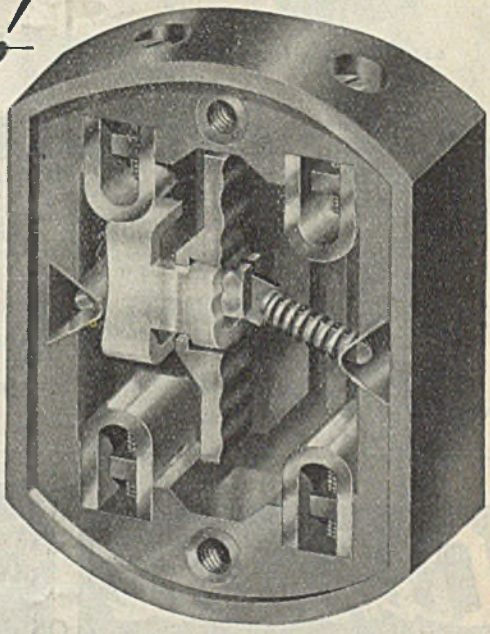
M-W.75

NOW - A SWITCH WITH ALL THE FEATURES YOU HAVE SOUGHT!



The above shows the basic Hi-Craft switch body which is incorporated with Surface and Flush switch and switch socket covers.

- Slow break/Quick make.
- Self-cleaning impact contacts — will not arc, pit or corrode.
- Heavy copper fixed and moving contacts, silver clad. Self-aligning slider action.
- Floating movement—eliminates pivots.
- Springs under compression —not torque.
- Small, compact, completely enclosed and insulated body.
- No exposed metal parts.
- External wiring applied direct to contact surfaces.



The cutaway illustration reveals some of the features which have established the easily and cheaply installed Hi-Craft A.C. Switch as the strongest, simplest, most efficient and safest switch on the market. These claims are endorsed by many users (including local authorities), and proven by National Physical Laboratory tests which included 100,000 continuous operations in circuit without affecting mechanical or electrical efficiency.
Approved by M.O.W. and conforming to B.S.I.S. 1299/46.

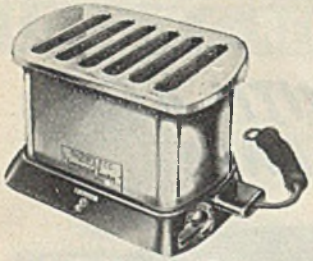
A TYPE FOR EVERY NEED

Supplied in Surface and Flush Single and Multi-gang models to fit all wood and metal wall boxes. Various cover styles, with sockets and switch sockets to match. Details and prices on request.

THE **Hi-Craft** 5-AMP. A.C **SWITCH**

S&B SMART & BROWN PRODUCTS

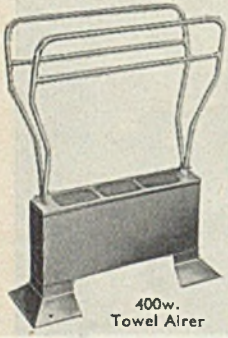
HI-CRAFT ELECTRICAL PRODUCTS LTD.
25 Manchester Square, London, W.1. Tel: Welbeck 7941



6 Slice Commercial Toaster

Toaster with Rack

Hair Drier



400w. Towel Airer

"ROWLETT"

ELECTRICAL APPLIANCES

Soundly constructed, well finished, fully guaranteed electrical appliances. Each article is packed in a separate carton. Photographs and details of these and other lines upon application to:—

ROWLETT ENG. CO. LTD.

2 CHURCH ROW, LONDON, S.W.18

PRECISION ENGINEERS . . TOOL MAKERS
METAL STAMPERS

TRADE ENQUIRIES INVITED.

Electric Fire with Independent Boiling Ring

Litholite
45 Years of
Plastic
Moulding

LITHOLITE INSULATORS &
ST. ALBANS MOULDINGS LTD.

WATFORD

'PHONE: WATFORD 4494

Phase
Buttons.

FOR DOMESTIC
& INDUSTRIAL
SERVICE BOARDS

Brilliant Permanent Colours

RED • BLUE • GREEN
YELLOW • WHITE • BLACK

PACKED IN CARTONS OF
100 WITH FIXING NAILS

CRITCHLEY BROS. LTD.

BRIMSCOMBE • STROUD • GLOS.

Phone: Brimscombe 2208

DEPENDABILITY
ELEPHANTIDE
REGISTERED
The BRITISH MADE
PRESSBOARD INSULATION
for
TRANSFORMERS
SWITCHGEAR
MOTORS
and all other
ELECTRICAL
APPARATUS
B.S. & W. WHITELEY LTD.
POOL-IN-WHARFEDALE · YORKS.
Telegrams: "WHITELEY, POOL-IN-WHARFEDALE"
Telephone: ARTHINGTON 98 and 99
LONDON OFFICE: 104 HIGH HOLBORN, W.C.1
Telephone: CHAncery 7646

RESISTANCE
WIRE

80/20 or 65/15
NICKEL CHROME

- DRAWN TO RESISTANCE, NOT TO SIZE
- BRIGHT ANNEALED—OXIDISED OR HARD DRAWN STATE
- SIZES 20 TO 47 S.W.G. OR TO B & S GAUGES
- EVEN SPOOLING
- GOOD DELIVERIES GIVEN

Contractors to ADMIRALTY WAR OFFICE AIR MINISTRY

STAINLESS STEEL WIRE Co. Ltd.
The Barracks . Langsett Road
Sheffield, 6

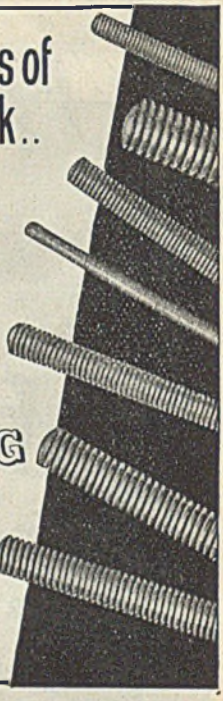
Telephone: 44241-2 *Telegrams:* Fynewire, Sheffield

We have Millions of Threads in Stock..

Carefully cut around Steel and Brass Rods of various lengths, from $\frac{1}{16}$" to 1" in diameter, we have millions of Whitworth B.S.F. and B.A. Threads in stock. Send us your enquiries for

STUDDING

Large Stocks
Prompt Delivery



TELCO LTD.
3 NEWMAN ST. LONDON W.1 Museum 5701

PROMPT DELIVERY

HIGH SPEED

ELECTRIC INDUCTION MOTORS

Scophony fractional horse-power motors are units of concentrated energy giving extraordinary high performances for their size. Specially designed for use in aircraft, marine craft and wherever space and weight are restricted, they are extremely reliable. A Scophony product means it is a precision job.

Full particulars sent on application

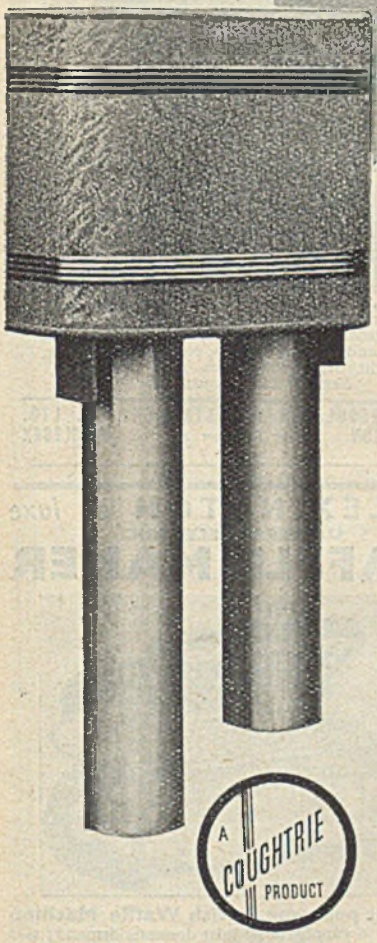
SCOPHONY LIMITED

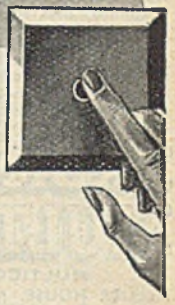
36, VICTORIA STREET, LONDON, S.W.1.

Telephone : ABBey 4852.

The Melo-chyme DOOR CALL

—BRINGS HARMONY TO THE *Home*





At each pressure on the door push the Melo-chyme emits a deep resonant note of two harmonious tones and is a delightful contrast to the irritating shrill of the normal door bell.

Exceptionally simple fitting. Operates from battery or mains.

PRICE

47/6

plus Purchase Tax

Transformers for use with the Melo-chyme door Call - - - - **15/6**

A COUGHTRIE PRODUCT

Also at
BIRMINGHAM
MANCHESTER
GLASGOW
NEWCASTLE

For full particulars apply to

H. & D. CHURCHILL LTD.

(Wholesale and Export)

WALNUT TREE WALK, KENNINGTON, LONDON, S.E.11

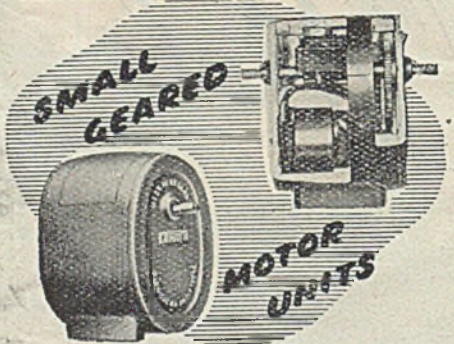
THE MODERN *Speedy* WAY OF MAKING SOLDERED JOINTS ON ELECTRICAL EQUIPMENT

You don't require extra flux when you use Ersin Multicore Solder. It contains 3 cores of super-active non-corrosive Ersin Flux. Ensures rapid melting and flux continuity, thus speeding up soldering operations and eliminating waste, with freedom from dry or H.R. joints. Sound joints can readily be made on oxidised surfaces.

ERSIN MULTICORE

MULTICORE SOLDERS LTD.
MELLIER HOUSE, ALBEMARLE ST., LONDON, W.1
Tel.: REGent 1411 (P.B.X. 4 lines)

FOR ILLUMINATED MODELS
ADVERTISING SIGNS · FLASHERS



Unidirectional or reversing, with or without self-switching, 100/110 or 200/250 volts A.C.

FINAL SHAFT SPEEDS:
Reversing Max 600 R.P.M. 27 min. per rev.
Unidirectional Max 280 R.P.M. 60 min. per rev.

TORQUE: Reversing 60 lbs. in. max.
Unidirectional 37 lbs. in. max.

For: Operating valves, dampers or rheostats, cinema projectors, rotating screens, illuminated signs, small working models, Geneva movements for drum-type switches, rocking baths, work movement, soldering and welding fixtures, continuous turning, feed of light strip under process.

(R.Q.3.) *Send for List No. 302-1. D*

DRAYTON REGULATOR & INSTRUMENT CO. LTD.
WEST DRAYTON *West Drayton 2611* MIDDLESEX

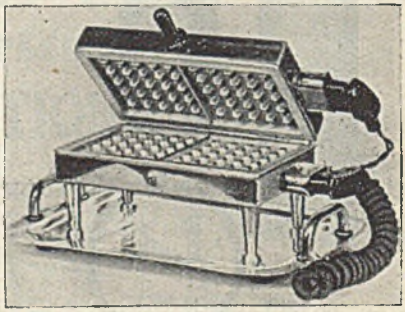
FOR SAFE CONDUCT
use CAPOTHENE CABLES

POLYTHENE INSULATED and sheathed with P.V.C.

Let us send you details of the wide Range available

CABLES AND PLASTICS LTD.
9 NEWTON RD LEEDS.7.

The LEXINGTON *de luxe*
UNIVERSAL ELECTRIC
WAFFLE MAKER

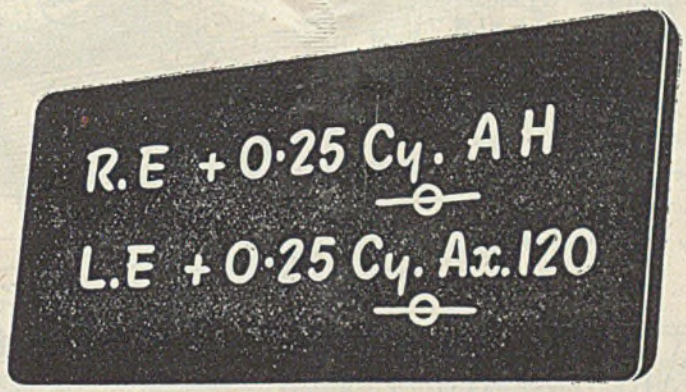


The first post-war British Waffle Machine

Designed to supply the popular domestic demand; also for use in the catering trade in Home and Export markets. ● This appliance is now free from Purchase Tax and has been approved by the Good Housekeeping Institute and major electricity undertakings. ● Aluminium throughout in polished or anodised finishes. ● Grease tray with rubber feet protects polished tables. ● Incorporates full safety measures and conforms to I.E.E. regulations.

A.C./D.C. 200-250v, also 100-110v models available. Load only 900 watts. Guaranteed 6 months.

COOPER MANUFACTURING CO.,
Hanway Works, Hanway Street, W.1.
Phone: MUSeum 9779.



Clear as crystal . . .

To the optician this prescription is as clear as the lenses it specifies. To the electrician it means nothing.

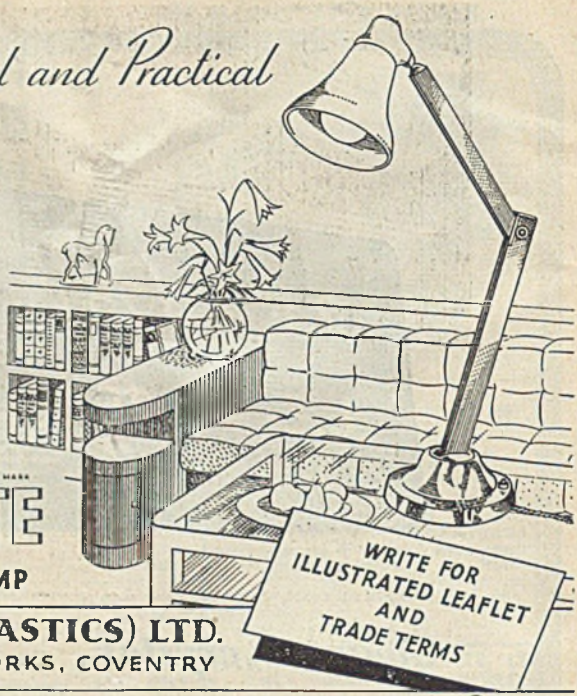
The modern specialist cannot hope to master the secrets of another's trade. He has enough to do in keeping abreast of developments in his own profession. If his eyes give trouble he seeks an oculist; when he needs medical aid he goes to a doctor; for legal advice he engages a solicitor . . . for expert opinions on topical problems of every kind he relies on

The Listener

A *BBC* PUBLICATION EVERY THURSDAY 3d.

Modern, Beautiful and Practical

At a touch the "Wandalite" Adjustable Table Lamp takes up any position you require, yet because of the unique balanced mechanism it always "stays put"—light exactly where you require it.

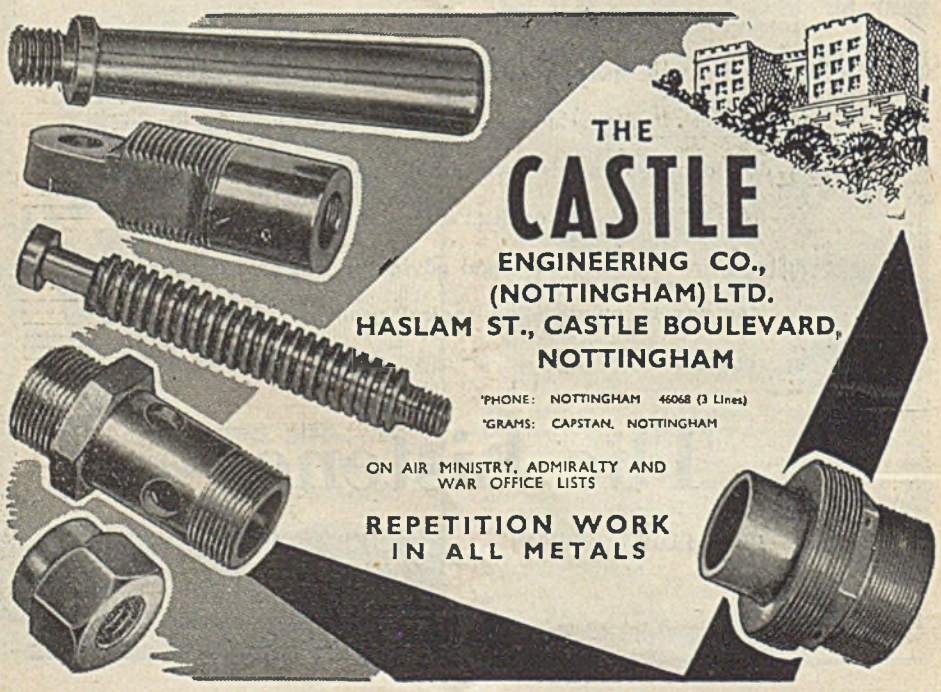


WANDALITE
ADJUSTABLE TABLE LAMP

WRITE FOR ILLUSTRATED LEAFLET AND TRADE TERMS

CORNERCROFT (PLASTICS) LTD.
subsidiary of Cornercroft Ltd. ACE WORKS, COVENTRY

W. 12L



THE
CASTLE
ENGINEERING CO.,
(NOTTINGHAM) LTD.
HASLAM ST., CASTLE BOULEVARD,
NOTTINGHAM

'PHONE: NOTTINGHAM 46068 (3 Lines)
'GRAMS: CAPSTAN, NOTTINGHAM

ON AIR MINISTRY, ADMIRALTY AND WAR OFFICE LISTS

REPETITION WORK
IN ALL METALS

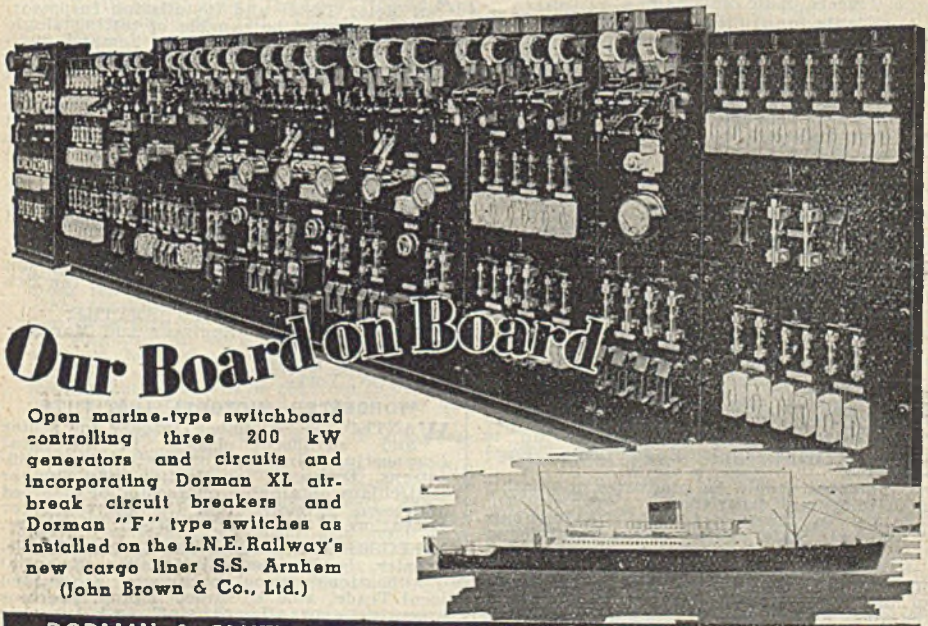
For sixty years we have maintained our reputation for accuracyand efficiency, and in this, our Diamond Jubilee Year, we are proud to offer to the trade, refractories of the highest quality at strictly competitive prices.

If you require insulators of guaranteed reliability and efficiency, let us quote you.

WILLIAM KENT (PORCELAINS) LTD.

Wellington Street, Burslem, Stoke-on-Trent

Telephone Stoke-on-Trent 84237/8



Open marine-type switchboard controlling three 200 kW generators and circuits and incorporating Dorman XL air-break circuit breakers and Dorman "F" type switches as installed on the L.N.E. Railway's new cargo liner S.S. Arnhem (John Brown & Co., Ltd.)

DORMAN & SMITH LTD. · MANCHESTER · LONDON · GLASGOW

E2|47

CLASSIFIED ADVERTISEMENTS

SITUATIONS VACANT

SPENBOROUGH URBAN DISTRICT COUNCIL.

ELECTRICITY DEPARTMENT.

Electrician-Wireman.

APPLICATIONS are invited for the position of Electrician-Wireman in the above Department.

Applicants must have had experience in the repair of appliances and the wiring of installations.

Wages and working conditions in accordance with N.J.I.C. No. 2 District Section "B." Present rate 29.25d. per hour for a 47-hour week.

The appointment will be subject to the Local Government Superannuation Act, 1937, and the successful candidate will be required to pass a medical examination.

Applications, stating age, experience and present position, together with copies of not more than two testimonials, to be forwarded to Mr. Norman Ashton, A.M.I.E.E., Engineer and Manager, Electricity Department, 24, Market Street, Cleckheaton, and delivered not later than Monday, August 4th, 1947.

D. COUPE,
Clerk of the Council.

Town Hall,
Cleckheaton, YORKS.
11th July, 1947.

THE Central Electricity Board have vacancies on their permanent Staff for:—

1. Senior Draughtsmen.
2. Junior Draughtsmen
3. Tracers (male or female).

Applicants for (1) must have had considerable experience in one or more of the following:—

(a) Electrical layout of H.T. Sub-stations.
(b) Brick buildings.
(c) Steel and R.I.C. structures.
(d) R.I.C. foundations,

and should state experience (if any) in taking off and billing quantities.

Applicants for (2) should have similar experience but not so extensive.

Commencing salaries will be not less than A.E.S.d). rates (London area).

Applicants must state age and give full details of education, qualifications and experience and submit their applications to the Chief Engineer, Central Electricity Board, Trafalgar Buildings, 1, Charing Cross, London, S.W.1, by Monday, the 28th July, 1947.

THE POLYTECHNIC,

309, Regent Street, W.1.

SCHOOL OF ENGINEERING.

REQUIRED for September next, a FULL-TIME LECTURER AND DEMONSTRATOR in TELECOMMUNICATIONS SUBJECTS up to Higher National Diploma and B.Sc. (Eng.) standard.

Candidates should be graduates, preferably with industrial experience.

Salary in accordance with the Burnham (Technical) Scale, subject to the usual deduction of 5 per cent. for superannuation.

Further particulars and form of application, which should be returned within two weeks of the date of this advertisement, may be obtained by sending a stamped addressed foolscap envelope to the undersigned.

J. C. JONES,
Director of Education.

SITUATIONS VACANT

CORPORATION OF KIRKCALDY.

ELECTRICITY DEPARTMENT.

APPLICATIONS are invited for the position of Mains Superintendent from Chartered Electrical Engineers, not exceeding 45 years of age, who have held a responsbile position in the distribution department of an electricity supply undertaking. Applicants should have considerable experience in the design, construction, commissioning and maintenance of E.H.T. and L.T. distribution systems including sub-stations, be able to prepare estimates and specifications for this work, and have a sound knowledge of modern methods of street lighting by electricity. The salary and conditions of service will be in accordance with the N.J.B. Agreement, Class E, Grade 3 (at present £619/633 per annum), and the selected candidate will be required to pass a medical examination. Applications endorsed "Mains Superintendent," stating age, qualifications, training and experience, along with copies of not more than three recent testimonials, should be in the hands of the undersigned not later than 31st July, 1947.

JOHN H. McLUSKY,
Town Clerk.

SKIPTON URBAN DISTRICT COUNCIL.

ELECTRICITY DEPARTMENT.

Appointment of Meter Tester and Installation Inspector.

APPLICATIONS are invited for the position of Meter Tester and Installation Inspector. Applicants must be capable of testing single phase meters and maximum demand indicators, and also must be acquainted with regulations governing all types of electrical installations.

Wages and conditions will be in accordance with the National Joint Industrial Council for the Electricity Supply Industry (Zone "B"), at present 2s. 7½d. per hour for 47-hour week.

The appointment will be subject to the Local Government Superannuation Act, 1937, and the successful candidate will be required to pass a medical examination.

Applications, stating age and qualifications, should be forwarded to the undersigned not later than the first post on Tuesday, the 29th July, 1947.

W. V. SMYTHE,
Engineer and Manager.

Electricity Offices,
79, Caroline Square,
SKIPTON, Yorks.

WORCESTER VICTORIA INSTITUTE.

WANTED for September, teacher for senior and advanced classes in Electrical Engineering. Graduate or equivalent qualifications. Forms of application and further particulars obtainable on receipt of stamped addressed envelope from the Secretary for Education, 4, Copenhagen Street, Worcester.

ELECTRICAL.—Leading Birmingham Wholesaler requires General Manager. Essential qualifications: good organiser, acquainted local Trade, able to direct buying, previous executive exper. Large staff and turnover exists. Good remuneration and permanency.—Full details, Box L.F.P., "THE ELECTRICIAN," 154, Fleet Street, London, E.C.4.

SITUATIONS VACANT

STOKE-ON-TRENT CORPORATION.

ELECTRICITY DEPARTMENT.

Meter Testers (2), Grade 1.

APPLICATIONS are invited for the appointment of two qualified Meter Testers. Applicants must be capable of testing single-phase, polyphase, and D.C. meters and also maximum demand indicators, and indicating and recording instruments.

The wages and conditions will be in accordance with the Agreement of the National Joint Industrial Council for the Electricity Supply Industry; wages at present £5 17s. 6d. gross per week of forty-seven hours. The appointments will be subject to the provisions of the local Superannuation Act, 1937, and the successful candidates will be required to pass a medical examination.

Application form and further details may be obtained from the General Manager, Electricity Department, 31, Kingsway, Stoke-on-Trent. Completed applications should be returned in the envelope provided so as to be received not later than Friday, 1st August, 1947.

HARRY TAYLOR,
Town Clerk.

Town Hall,
STOKE-ON-TRENT.

LINCOLN CORPORATION.

ELECTRICITY DEPARTMENT.

Assistant Meter Superintendent

APPLICATIONS are invited for the position of Assistant Meter Superintendent in a Class "A" Polyphase Meter Testing Department. Applicants should have a sound technical training and be fully conversant with the maintenance of all types of Meters and Instruments. The conditions of employment will be in accordance with the National Joint Board Agreement, and the salary will be grade 8a, Class "G," at present £437 per annum.

The successful candidate will be required to pass a medical examination, and the appointment will be subject to the Local Government Superannuation Act, 1937. Applications should be forwarded to the undersigned, and should be received not later than Wednesday, the 6th August, 1947.

F. NEWEY,
Engineer and Manager,
Electricity Department,
Brayford Side North,
LINCOLN.

H.M. COLONIAL SERVICE.

APPLICATIONS are invited for the post of Lecturer in Electrical Engineering, Technical Institute, Lagos, Nigeria. Candidates should have appropriate degree qualifications or an equivalent standard qualification of a professional body. Previous teaching experience is desirable.

The teaching of Electrical Engineering is a new departure for the Institute, and at first the standard of work attained by students will not be high. The successful candidate will be in complete charge of this Section of the Institute. He will be required to organise courses of instruction and to teach Day and Evening students.

Salary £660 - £1 300 according to qualifications and experience.

The post is pensionable. Terms of service include free quarters, free passages for officer and wife on appointment and on leave, outfit allowance of £60 on first appointment, free medical attention and home leave on full pay after eighteen months tour at rate of seven days for each month of resident service. Income tax is payable at low West African rates only.

Applicants should write at once to the Director of Recruitment (Colonial Service), 15, Victoria Street, London, S.W.1, stating age, professional qualifications and experience.

SITUATIONS VACANT

UNIVERSITY OF BIRMINGHAM.

FACULTY OF SCIENCE.

APPLICATIONS are invited for the post of Lecturer in Electrical Engineering (Grade 11a) at a salary of £750 - £850 p.a. The appointment will date from 1st October, 1947. The qualifications required should include those necessary to teach the principles of Electrical Machines.

Three copies of applications, with the names of three referees, should be sent to the undersigned not later than 12th August, 1947, from whom further particulars may be obtained.

C. G. BURTON,
Secretary.

The University,
Edmund Street,
BIRMINGHAM, 3.
July, 1947.

ARMATURE winding Charge-hand required for repair shop, to control female labour on small Armature and Stator winding. Applicant must have experience of A.C. and D.C. winding.—The Midland Electric Installation Co. Ltd., Cyprus Works, Upper Villiers Street, Wolverhampton.

EXPERIENCED Industrial Lighting Engineer required for London area. Excellent prospects for the right type of man. Apply, giving full particulars, to—Veritys Ltd., 66, Quay Street, Manchester, 3.

SITUATION WANTED

YOUNG man, 27 years of age, energetic, single, and willing to travel anywhere in the world, wishes employment. Have spent several years in the tropics and remained healthy. Ex-R.A.F.; wide electrical experience, but will take any suitable employment, preferably in the tropics or travelling in the tropics.—Box L.F.O., "THE ELECTRICIAN," 154, Fleet Street, London, E.C.4.

FOR SALE

CIRCUIT BREAKERS: 15 amp. 250 v. Single Pole; complete with automatic overload cut-out; robust moulded construction. Accepted by most supply undertakings as efficient switch fuses if used in conjunction with our Distribution Boards.

DISTRIBUTION BOARDS: 5 and 15 amp.; 2, 3, 4 or 6 way; D.P. or S.P. and N.P.; wood cases; improved design and finish. No permit required.

EKCO and SMITHLITE FLUORESCENT FITTINGS: Complete; ex stock. Large quantities available; carriage paid.

ELECTRIC MOTORS: 1 h.p. Squirrel Cage Induction Motors (Tilling-Stevens), 400/440/3/50, 930 r.p.m.; new.

INSULATORS: Suitable for overhead service cables. Bakelite, brass inserts; screwed P.O. thread for pin mounting; vertical type with drip groove, 5/8 in. high, 3/4 in. dia. Large quantities available; sample 2s. per return. Discount on quantities.

WOOD SWITCH BLOCKS: 3½ in. round and square, 6 in. by 3 in. by ½ in.; 9 in. by 3 in. by ½ in. and 6 in. by 6 in. by 1 in. White Enamelled and Walnut Finish from 6s. 6d. to 6s. 3d. per dozen respectively. Discount on quantities and for natural finish.

METROPOLITAN DISTRIBUTION LTD., TRURO.

ELECTRIC MOTORS, A.C. and D.C. We supply all types and sizes of Electrical Machinery—Slow Speed Reduction Gears can be supplied to customers' requirements with short deliveries. Send your enquiries to The Electropower Co., Ltd., 3, Retreat Close, Kenton, Middlesex. Tel.: WORdsworth 4928.

CERAMIC Rods, suitable 110-250v., 750-1 000w., 9 in. to 10½ in., ⅝ in. dia. Different threads, 1s. each lots 5 000. Also complete 80/20 N.C. Wire.—Sole Agent, Richard Voss, 6, Merton Way, Hillingdon, Middx.

FOR SALE

5 000 YARDS 3-core C.M.A. circ. Glace Cotton Flex, 9/.012 and 16/.012, and quantity of twin-core. 10 cwt. 24G. Nickel-Chrome Resistance Wire, 65/15% by Fox and Concordia. 5 Tons ½-hard commercial purity aluminium strip (Brit. and Northern Alu. Cos.) in original coils, 13½ in. wide by 22 S.W.G. 2 Tons ⅜ in. dia. ¾-hard aluminium rod. 2 Tons ⅜ in. dia. duraluminium rod.—Please enquire Whyte-Leafe Machine Tools Ltd., 107, Albert Road, S. Norwood, S.E.25. ADDiscombe 6055/6/7.

50 ¾ h.p. NEW "ENGLISH ELECTRIC" Motors. 230/50 Volts: Single Phase: Cont. Rating. Price £8 10s. Cash with order. Delivery immediate. Carriage 2s. 6d.—Stark, 215, London Road, Mitcham.

15 AMP. SWITCHPLUGS.—Three pin surface metalclad complete with plug tops. Post free, 17s. 6d. each. Reduction for quantities. 17s. each in dozens. 16s. each in gross lots. Cash with order only.—Pruden and Pope, 38, Church Road, Upper Norwood, S.E.19. Tel.: LIVingstone 1426. Get our reduced Summer Prices for PENCIL type electric elements.

EXHAUST Fans, 200/250 v., 50 cycles, single-ph., 1 200 r.p.m., totally enclosed induction; 8 in. diameter blades, £3 5s. 6d. each; 10 in. diameter, £3 15s. 6d.—Johnson Engineering, 319, Kennington Road, S.E.11. REL. 1412/3.

CONDENSERS, H.V. Transformers (all types), Relays, Junctions, etc., and wide range and quantities of Electrical Accessories and equipments, All New.—M.M.C., 206/210, Bishopsgate, London, E.C.2.

40 HUGHI Scott Forge Blowers, 110 volts D.C., approx. ¾ h.p. Motor and blower mounted as one unit. As new.—Hurst Electrical Industries Ltd., 75a, Well Street, E.9. Tel. Amhurst 4166.

ONE—100 KW. Generator, L.D.C., 220 v., 450 r.p.m. compound, sleeve bearings, screen protected, with switchboard comprising voltmeter, ammeter, circuit breaker, regulator. Guaranteed first-class condition. Available immediately. One—12 h.p. motor, Laurence Scott, 500/750 r.p.m. 220v. D.C. complete with starter and field regulator. Reconditioned. Ex stock.—Electropower Co. Ltd., 3, Retreat Close, Kenton. WORdsworth 4928.

SOCKETS and PLUGS (heavy industrial type).—250v., 15 amps. Three pin plugs, 2 pole and earth, with T.R.S. Gland and screwed ring. Sockets, 2 pole and earth, flange mounting, threaded to match plug. Complete with chained socket cover. New and unused. Price 13s. 6d. per unit, delivered.—Cox and Danks, Ltd., Plant and Machinery Department, London; Faggs Road, Feltham, Middx. Manchester: Frederick Road, Pendleton.

JACK PORTER, LTD., Bargains.—New small guaranteed D.C. Motor GENERATORS, dual windings, laminated fields, car radio type, 6 volt input, 230 volts, 50 milliamps output, 17s. 6d. Super 12 volt models, for mobile amplifiers, 250 volts, 120 milliamps, 19s. 6d. Vibrator Packs, 6 volts "Masteradio" and "Philco," 100 to 120 volts, 15 milliamps, guaranteed working and complete, 15s. Cash with order.—Jack Porter, Ltd. (Radio), College Street, Worcester. Phone 2442.

DYNAMO & MOTOR REPAIRS LTD.,
Wembley Park, Middlesex.
Telephone: Wembley 3121 (4 lines).
Also at Phœnix Works, Belgrave Terrace, Soho Road, Handsworth, Birmingham.
Telephone: Northern 0898.
REBUILT MOTORS AND GENERATORS.
Long deliveries can often be avoided by purchasing rebuilt secondhand plant. We can redesign or replace surplus plant of any size.
SEND US YOUR ENQUIRIES.
OVER 1 000 RATINGS ACTUALLY IN STOCK HERE.

FOR SALE

HACKBRIDGE TRANSFORMER, single phase kVA, output, 5 primary volts, 480, secondary 200, £15 or offer.—Austral Development, Ltd., 95, Gresham Street, E.C.2.

JUNCTION Electric Irons, complete with Stand, Switch connector, and Flex, again available, very prompt deliveries (beautifully chromium plated. The finest of its kind in the world, A.C., D.C., in all voltages), with rich range of other Household Electrical Appliances. Distributors: Brooks and Bohm, Ltd., 90, Victoria Street, London, S.W.1.

FLUORESCENT LIGHTING.—Delivery from stock of 5 ft., 4 ft. and 3 ft. fittings complete with gear and tube, from £7, subject to usual trade terms. Write for full list.—Drubel Radio Distributors Ltd., 39a, Stafford Road, Croydon, Surrey. Croydon 1107/8.

PACKING Cases for Export, etc.—F. Rawle and Co. Ltd., 71, Kensington Avenue, London, E.12. 'Phone: GRAngewood 2003.

ONE Heating Furnace, modern, all electric, by Birlec Ltd. Thermostatically controlled and complete with all equipment, internal size of oven 4 ft. 9 in. by 3 ft. by 3 ft.—Apply C.S. Ltd., Staffa Works, Staffa Road, Leyton, E.10.

PORTABLE Arc Welding Sets: One Petrol Driven "Petbo," 300 amps. One Petrol Driven "Harbour," 300 amps. One Electric Driven "Metro-Vick," 300 amps., A/C.-D/C. One "Quasi Arc" 3 ph. 20 K.V.A., 200-400 amps. One 5 K.V.A. 230/1/50 Petrol Driven Generator, direct coupled to Coventry Climax Engine. Mounted on Steel Chassis. A/C. Motors: Two 7 h.p. 415/3/50 570 r.p.m. S.R. B.B. Vertical mounting, with O.I. Starters. One 11 h.p. Siemens 440/3/50 1 000 r.p.m. S.R. P.B. One 18 h.p. A.D. and M. 420/3/50 575 r.p.m. S.R. B.B. One 20 h.p. Crompton Parkinson 400/3/50 1 500 r.p.m. S.R. B.B. One 44 h.p. Siemens 440/3/50 750 r.p.m. S.R. P.B.—Details from A. W Barker and Co. Ltd., Colnbrook, Slough.

WE can supply all types of Presspahn Insulating Pieces to your specification. Your enquiries are appreciated.—Tradex Manufacturing Co., 92, Station Road, Swindon. Swindon 3696.

450 SATCHWELL thermostats, tubular type, W.O, variable 10 degs.-90 degs. C. 3 000 wire wound potentiometers by Fox and B.E.R. 50 watt 50 ohm and 500 ohm 20 watt loading. All brand new tested stock offered, substantially discounted for quantities.—Partridge, Wilson and Co. Ltd., Davenset Electrical Works, Leicester.

H.S.L. (ELECTRIC), 29, Grosvenor Road, Ilford, Essex.—Radio and electrical wholesalers since 1930; stock lists always available.

BRITISH Electric Co. (Beco) Ltd., can supply most types of A.C. and D.C. Motors from stock.—British Electric Co. (Beco) Ltd., Electra House, 25/29, Lower Road, Rotherhithe, S.E.16. Bermondsey 3449.

TIME SHEETS.—Our stock-printed Time Sheets are remarkably cheap compared with specially printed ones. On decent quality 8 in. by 10 in. paper:—100, 3s. 6d.; 500, 15s.; 1 000, £1 7s. 6d. Post Free. Send for sample.—F. H. Brown Ltd., P.O. Box 26, Burnley, Lancs.

PENCIL Bars, Boiling Rings, Flat Bars, wired to customers' requirements. Large stocks. Quality guaranteed. Spirals wired and dispatched by return. Special elements to customers' requirements supplied.—New Products (Nottingham) Ltd., 6a, Peas Hill Road, Nottingham.

FLUORESCENT LIGHTING UNITS, 4-ft. and 5-ft. Self Contained and complete with tubes. Write for new illustrated trade list. Enquiries invited from buying agents for export.—MOSS BROS., 53, Goodge Street, W.1. MUSeum 5385.

FOR SALE

WRITE for particulars of the **SCEMCO** 15 A switched socket (Surface). Delivery 7-14 days, orders in rotation.—**SCEMCO LTD.**, Scemco House, 6/7, Soho Street, S.W.1.

FLUORESCENT LIGHTING. — 80 Watt Control Gear supreme. "The Scemco Unit" guarantees immediate starting regardless of supply voltage cuts. Operates from 160 volt; dispenses with Starter switch and high voltage strike. Enhances tube life. Each unit guaranteed. Delivery ex-stock. —Particulars from **SCEMCO LTD.**, Scemco House, 6/7, Soho Street, W.1.

FLUORESCENT LIGHTING: See our stand No. 99 at the Public Works, Roads and Transport Exhibtion at Olympia—July 21st-26th. Send for Catalogues and complimentary ticket. **SCEMCO LTD.**, Scemco House, 6/7, Soho Street, Oxford Street, London, W.1. Telephone: Gerrard 1461/2/3.

FLUORESCENT FITTINGS — Trough or Flush type fitted Hi-Craft Ballast control gear, complete with tubes. Delivery from stock.—Apply.—**SCEMCO LTD.**, Scemco House, 6/7, Soho Street, London, W.1. Tel.: GER. 1461/2/3.

FLUORESCENT LIGHTING.—1 000 Fittings complete with tubes always in stock, for immediate delivery. Send for our 15 page List Price Illustrated Catalogue. Generous discounts to Export, Wholesale and Trade.—**SCEMCO LTD.**, Scemco House, 6/7, Soho Street, London, W.1. Telephone: GERrard 1461-2-3.

FLUORESCENT LIGHTING FITTINGS, 4 ft., 40 watt, Flush and Trough complete with tubes and guaranteed control gear from stock. —Apply:—**SCEMCO LTD.**, Scemco House, 6/7, Soho Street, London, W.1. GER. 1461/2/3.

BI-UNI.—The New Push-Button Flush-Fitting Domestic Switch. Wholesale Enquiries Only. Send for details—**SCEMCO LTD.**, Scemco House, 6/7, Soho Street, London, W.1. Tel.: GER. 1461/2/3.

BLOCKS, best quality, polished wood, imitation walnut. All standard sizes in stock at current prices.—B.E.M. Co., 25-27, Berners Street, London, W.1.

2 AND 4 way Fuse Boxes, 5 and 15 amp., 5 000 Multi Range Meters, Large quantity of Radio Components, Fluorescent Fittings, 5 ft. and 4 ft., from stock at keenest prices, Fluorescent Spares, 5 000 Chokes in stock, 40 and 80 watt., Power-Factors, 2's, 4's, 8's and 10's, thousands in stock. Starter Lamps, Thermal and Glow, Suppressors, 4 and 5 ft. Tubes, etc.—Phone or call, L. Goodman (Radio) Ltd., 9, Percy Street, Tottenham Court Road, W.1. MUSeum 0216.

ELECTRIC HOIST BLOCKS, capacity 5-cwt. to 7 tons. Reasonable delivery.—A Morgan and Co., 50, Wilkin Street, London, N.W.5. 'Phone: GUL. 1147.

HEAVY-DUTY ARC-WELDING PLANTS.—200 amps. Price £36 10s. complete. Also Spot Welders. £48 10s.—John E. Steel, Clyde Mills, Bingley. 'Phone 1066.

LADDERS, Trestles, Steps and Hand Carts from Ramsay and Sons (Forfar) Ltd., Forfar.

SACKS and Bags in excellent condition for all commodities, as low as 4½d. each. Write: John Braydon Ltd., 230, Tottenham Court Road, W.1. Tel. No.: Museum 6972.

TINNED STEEL ARMATURE BINDING WIRE.—All even numbered sizes from 16 s.w.g.-28 s.w.g. supplied from stock on 7 lb., 14 lb. or 28 lb. reels.
FREDERICK SMITH & CO. WIRE MANUFACTURERS LTD., CALEDONIA WORKS, HALIFAX.

PATENT AGENTS

MEWBURN, ELLIS & CO.,
PATENTS, DESIGNS AND TRADE MARKS,
70 & 72, Chancery Lane, London, W.C.2.
Grams: "Patent, London." 'Phone: Holborn 0437 (2 lines)
And at—NEWCASTLE: 3, St. Nicholas Buildings.

SALES BY AUCTION

G. R.

By Order of the Minister of Supply.
MINISTRY OF SUPPLY DEPOT, FEATHERSTONE.
Six miles from Wolverhampton, Staffordshire.
NOCK AND JOSELAND
are instructed to sell by Auction without reserve, at the above Depot, on
TUESDAY, WEDNESDAY and THURSDAY, 29th, 30th and 31st JULY, 1947, at 11 a.m., each day,
a large quantity of Valuable
INDUSTRIAL ELECTRICAL EQUIPMENT and PORTABLE POWER TOOLS,
including about:
3 200 MOTORS various h.p., and voltage, A.C. and D.C., including geared and flame proof types and 200 Electric Fan Motors.
262 MOTOR ALTERNATORS, standard A.C and D.C. voltages.
250 CONTROL GEAR UNITS motor driven and friction drive. 140 Boosters for voltage control, 120 Electric flex shaft Polishers and Grinders, 80 Suds Pumps and Sump Pumps.
570 GENERATORS up to 72 K.W.
127 TRANSFORMERS up to 114 K.V.A. 20 Riveting and Etching Machines, 9 D.C. Spot Welders 40 K.V.A., complete with Transformers, Circuit Breakers and Rectifiers, and other Arc Welding Equipment. 6 Static Condensers 20 K.V.A., 170 Starters and a large quantity of small Industrial Switchgear.
Also **A Large Quantity of Equipment,** including: Control Panels, Contactors Panels, Furnace Control Panels, Testing Panels, Frequency Changers, Switchboards, Distribution Boards, Fuse Boards, Rectifier Units Dynamos and Super-Charges. Pneumatic Grinder (Holman).
120 **Drill Steel Bits.** Quantity of Copper Strip and Copper Bus Bar.
A Large Quantity of T.R.S. and P.V.C. Multi-Core Cable.
ON VIEW Tuesday, Wednesday, Thursday, Friday and Monday, 22nd, 23rd, 24th, 25th and 28th July, 1947, between the hours of 10 a.m. and 4 p.m.
ADMISSION to View and Sale by Catalogue only. Each Catalogue will admit two persons on View Days and one person only on Sale Days.
CATALOGUES One shiling each (post free on receipt of Post Order) may be obtained from the Auctioneers:
NOCK AND JOSELAND, 48, Queen Street, Wolverhampton, Staffordshire (Tel.: 20070).

NOTICES

THE Electrical and Radio Department of Rd. Johnson, Clapham and Morris Ltd., which was transferred, firstly to George Leigh Street, and later to 7/9, Swan Street, Manchester, following the destruction of their warehouse in Trafford Park by enemy action, is now re-established at Jacem House, Trafford Park, Manchester, 17.

A branch, with Trade Counter and Showroom facilities, will be maintained at 7/9, Swan Street, Manchester, 4.

SITES TO LET

BLACKPOOL DEPARTMENTAL STORE—in best position in town—has sites to let for individual traders. Rental includes site, light, heat, modern fittings and equipment and service. Unique opportunity for small trader to enjoy store popularity in finest holiday resort of the North. The Electrical Department is still available for occupation.—Write to K and K Store, 7-11, Victoria Street, Blackpool.

FOR HIRE

FLUORESCENT LIGHTING UNITS FOR HIRE, WITH TUBES, per week or per month. State requirements.—**MOSS BROS.**, 53, Goodge Street, W.1. MUSeum 5385.

BUSINESS OPPORTUNITIES

SCEMCO, LTD., Fluorescent Lighting Specialists, announce their **AGENCY SERVICE** to Electrical Traders and Electrical Contractors. Applicants for "Selling Rights" of "**SCEMCO**" Fluorescent products in their individual districts are invited to apply for further details. Two Trade References must accompany initial enquiry. Applicants will be treated in rotation, priority being given to the 5 000 Electrical Traders and Contractors already on our Mailing List. Summary of "**SCEMCO**" Agency Service:—(1) **SCEMCO LTD.** will forward to their Accredited Agents, all Direct Consumer orders and enquiries they receive as a result of the SCEMCO Advertising Media. (Trade Press, Local Press, Exhibitions, Mail Order.) (2) **SCEMCO** Accredited Agent to receive, apart from Trade Discount of 25 per cent. and Cash Discount of 2½ per cent., an additional Agency Commission of 5 per cent. on all Sales in the allotted territory. (3) **SCEMCO** Accredited Agent to receive full benefits of the "Scemco Guarantee" regarding the replacement of Fittings and Components. (4) **SCEMCO LTD.** retain the right to nullify an Agency Agreement by one month's notice in writing should the Accredited Agent's service in any way prove unsatisfactory, and **SCEMCO LTD.** agree to the Accredited Agent having the same facility. This notice inviting Agency Applicants from Electrical Traders and Contractors will be closed on or before 30th July, 1947.—Scemco Ltd., 6/7, Soho Street, and at 18, Soho Square, London, W.1. Tel.: GERrard 1461/2/3.

ELECTRICAL wholesalers and exporters require continuous supplies of wide range of electrical accessories for home trade and export. Permanent business guaranteed.—Box L.F.A., "THE ELECTRICIAN," 154, Fleet Street, London, E.C.4.

NEW LINES REQUIRED FOR HOME TRADE AND EXPORT.—London wholesalers and exporters with agents throughout the world are prepared to conduct extensive advertising scheme to introduce new lines.—Send details to Box L.E.Z., "THE ELECTRICIAN," 154, Fleet Street, London, E.C.4.

ATTRACTIVE Selling Line.—Toaster constructed of heavy gauge steel, nickel plated throughout, polished top, spring loaded doors. State voltage when ordering. Net price 15s. Wholesale and Export enquiries invited.—Henbest Bros. Ltd., 26, Green Lanes, Palmers Green, N.13. Bowes Park 3247.

WORK WANTED

STANLEY ELECTRICAL LTD., Latimer Road, Teddington, Middlesex (Telephone Molesey 1973) invite enquiries for complete manufacture of light electrical and mechanical units and sub-assemblies involving capstan, turning, milling, drilling, blanking, pressing, soldering and assembly, etc. Varied stocks of own material available.

ARMATURES.—For vacuum cleaners, all types rewound.—32s. 6d. Complete overhaul of MOTORS our speciality, estimates free. Reconditioned Machines from £8. Vacuums, all makes.—From 20/-, Hope Street, Glasgow, C.2. Tel.: Douglas 6234.

ENQUIRIES solicited for all Press Work and Stampings. Keen rates, prompt delivery. John Drown and Co. Ltd., 7, Northampton Street, Birmingham, 18. Cen. 6381.

VACUUM CLEANER REWINDING SERVICE. commutators and Bearings. Prompt delivery and full guarantee.—Thomas Anderson, 117, Bowes Street, Blyth, Northumberland. 'Phone: Blyth 405.

REPAIRS

COOKERS.—We can give good deliveries of Sheet Metal Vitreous Enamelled Electric Cooker parts.—JOHN KING & SON (ENAMELLERS), LTD., PYRO WORKS, CHESTERFIELD. Phone: 5305.

EDUCATIONAL

UNIVERSITY OF LIVERPOOL.

FACULTY OF ENGINEERING.

Dean: Professor R. G. Batson, M.Eng., A.K.C., M.I.C.E., M.I.Mech.E.

THE University awards the Degrees of B.Eng., M.Eng., D.Eng., Ph.D., and a Certificate and Diploma in Engineering.

Degree Candidates must pass an examination or examinations for Matriculation into the University. Certificate Candidates must submit evidence of having received a good general education. Diploma Candidates must possess the Certificate in Engineering.

The Courses are designed for students desiring to qualify as MECHANICAL ELECTRICAL or MARINE ENGINEERS, as NAVAL ARCHITECTS and METALLURGISTS, or METALLURGICAL ENGINEERS. The Courses cover the subjects of examination for Associate Membership of the Institutions of Civil, Mechanical and Electrical Engineers. The Institutions named, subject to certain conditions, accept the degree of B.Eng. in lieu of part, and in some cases the whole, of the examinations for Associate Membership. The degree of B.Eng. in Civil Engineering admits to the special examination of the Chartered Surveyors' Institution. The various Departments are housed in commodious and well-equipped buildings, and provide ample facilities for research.

A Prospectus of the Faculty, giving particulars of Courses and a large number of Entrance Scholarships and Post-Graduate Studentships, may be had on application to the undersigned.

STANLEY DUMBELL, Registrar.

WANTED

WANTED: 24—4 h.p., 1 425 r.p.m. motors, 440/3/50, new or second-hand.—Replies J.W. C.S. Ltd., Staffa Road, Leyton, E.10.

A.C. MOTORS, 1-100 h.p., 500-1 500 r.p.m. Any make fitted with ball and roller type bearings. Must be good machines, such as you yourselves would buy. Alternatively motors for rewinding will be considered.—Oldfield Engineering Co., Ltd., 96, East Ordsall Lane, Salford, 5.

ELECTRICAL steel sheet or laminations of reputable make, .014 in. to .020 in. thick will be purchased for cash in any quantity by Davenset Electrical Works, Leicester.

AN unlimited number of modern A.C. motors urgently required for essential work. Highest cash prices paid for suitable units. We also want all types of motors for conversion and rewinding. Send details to Sales Dept., A. P. Watson, 104, Upper Brook Street, Manchester, 13.

AUCTIONEERS AND VALUERS

RICHARDS & PARTNERS,

Auctioneers and Valuers of
PLANT AND MACHINERY AND
INDUSTRIAL PROPERTY,

Granville House, Arundel Street,
London, W.C.2

Telephone: TEMple Bar 7471.

CORK

BRITISH CORK MILLS LTD.,

167, Victoria Street,
London, S.W.1.

Phone: VICtoria 1414/6. 7913

ELECTRIC ELEMENTS

Electrical heating elements for every type of Industrial and Domestic Heating Appliance.

SPIRALS *for* Grills, Cookers, Water Heaters
ELEMENTS *for* Kettles, Washboilers, Toasters.

HOTRAY WIRES LTD.
HOTRAY HOUSE, 157, CHESTER RD., MANCHESTER, 15. BLA 0160

THE *Electro-Power* SERVICE CO.

MOTORS
MAINTAINED, REPAIRED, REWOUND
Bought, Sold or Exchanged
15/17 HOWARD ROAD, LEYTONSTONE
Tel. : MARYLAND 2788

BOOKS

FOR THE PRACTICAL ELECTRICIAN AND RESEARCH WORKER

PLEASE STATE INTERESTS WHEN WRITING

H. K. LEWIS & Co. Ltd.
LONDON : 136, GOWER STREET W.C.1
Telephone : EUSton 4282 (5 lines)

Motors, Generators, Transformers
REWOUND
ALL SIZES WITH MINIMUM DELAY

For efficient service wire :
"Porter," Lincoln

PENNEY & PORTER (1932) LTD.
LINCOLN
'Grams : Porter 'Phone : 1706/7

MEICO

CHOKES for FLUORESCENT LIGHTING

MEICO'S up-to-date facilities include the most modern coil producing machinery available—vacuum impregnating equipment for wax and varnish—completely automatic production test apparatus. MEICO Chokes are precisely wound—meticulously assembled—thoroughly impregnated and carefully finished. Continuous inspection and quality control ensure maximum uniformity and silence in operation.

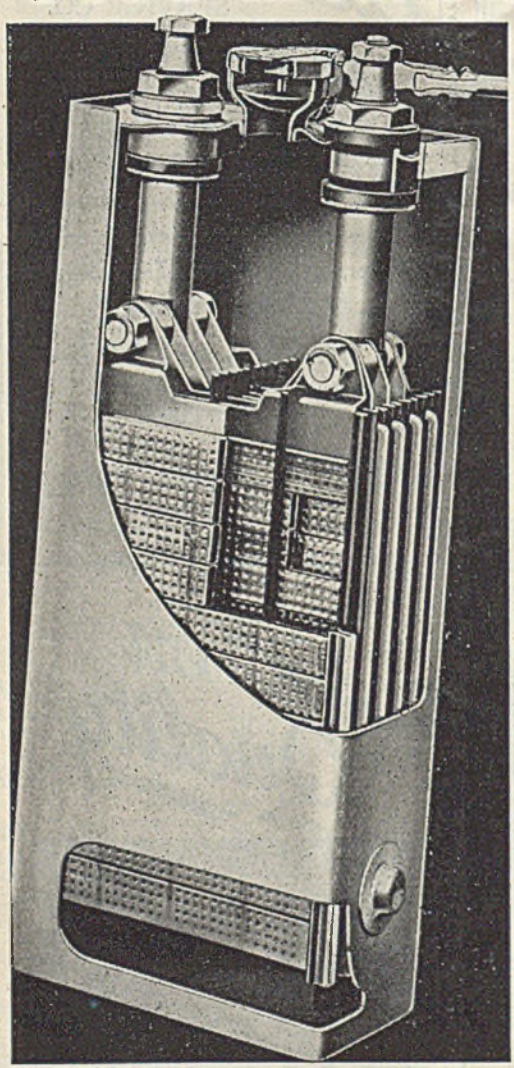
AVAILABLE FOR PROMPT DELIVERY

MICRAMATIC ELECTRICAL INSTRUMENT CO. LTD.
MEICO WORKS : CONGLETON : CHESHIRE
TELEPHONE: CONGLETON 607

accent on Quality

ELECTRICAL ACCESSORIES BY ELECTRO PLASTICS LTD
MILTON STREET · WATFORD
TELEPHONE: WATFORD 3324

NIFE All-Steel Batteries



- Containers, Terminals and even the Plates are made of steel and practically indestructible.
- Active material totally enclosed.
- Completely inert on open circuit and does not suffer from local action and standing loss.
- No corrosive fumes.
- Alkaline electrolyte non-corrosive to all cell parts, including terminals.

That's why there is

MORE LIFE in a NIFE

Now available for all purposes except private radio and private cars.

NIFE BATTERIES LTD., Redditch, Worcs.

POLITECHNIKA ŚLĄSKA BIBLIOTEKA GŁÓWNA

THE

ELECTRICIAN

ESTABLISHED 1861

Bouverie House - 154 Fleet Street - London EC 4

Telegrams: "BENBROTRIC FLEET LONDON" *Telephone*: CENTRAL 3212 (*12 lines*)

Editor: STANLEY G. RATTEE, A.M.I.E.E. *Publisher and Manager*: JOHN VESTEY

Number 3605 18 JULY 1947 *Vol* CXXXIX *No.* 3

CONTENTS

Views on Current Affairs 185
Portrait—Mr. E. T. Norris 188
Modern Supertension Cables 189
13A Fused Plug and Shuttered Socket 192
Domestic Wiring Problems 193
Practical Training of Engineers 195
Visit to Stourport 197
Electrical Personalities 198
Public Works Exhibition 201
Equipment and Appliances 203
Electricity Supply 205
Answers to Technical Questions 206
Electrical Units 207
Industrial Information 208
The E.I.B.A. 210
Contracts Open 211
Company News 212
Commercial Information 216

MIDLANDS OFFICE:
Daimler House, Paradise Street, Birmingham
Telephone: Midlands 0784—5

SCOTTISH OFFICE:
116, Hope Street, Glasgow, C.2
Telephone: Central 3970

The offices of THE ELECTRICIAN *are closed on Saturdays in accordance with the "Five-day Week" plan adopted by Benn Brothers, Ltd.*

SINGLE COPY (FRIDAY) - - - 6d.
(BY POST) - - - - 8d.

ANNUAL SUBSCRIPTION
HOME AND OVERSEAS - - - 30s.

Practical Training

THE publication this week of the report of the Joint Committee of the B.E.A.M.A., the Radio Industry Council and the I.E.E. which has been considering the question of practical training as applied to professional electrical engineers, should do much to ensure adequate recruitment in the industry for the next few years.

There is an insistent demand for an increase in the number of trained electrical engineers capable of filling responsible positions in industry, and though the output of the universities meets the need to some extent, not all graduates are regarded as being sufficiently conversant with practical engineering. The methods of half a century ago, when training was based more upon practical experience than upon academic courses, have given way to scholarship and college apprenticeship schemes as a result of the higher technical standards made necessary by engineering progress, but it has long been felt in the industry that something of a return, at least in part, to the old training methods would be a desirable addition.

Many of the larger manufacturing concerns with educational departments of their own, offer facilities for graduates and others to pursue a course of practical engineering on the lines suggested, but since such firms are relatively few, the Joint Committee was set the task of recommending how the position could be improved.

It will be recalled that the I.E.E. has already published two reports on the

subject of technical education and the training of engineers, and that published this week is concerned with including in the curricula a broad practical training. This, it is pointed out, would be possible by the provision of two types of professional apprenticeship, one of two years for apprentices who obtain their technical education as internal students, and another of four years for those who follow part-time courses.

Pre-Graduate Apprenticeship

IN the case of the two-year apprenticeship scheme suggested by the Joint Committee on Practical Training, it is recommended that the first year of the apprenticeship be served immediately on leaving school and before starting a main course of technical education, while the four-year scheme is designed on the same lines for those whose circumstances require them to follow a part-time course of technical study. The Committee offer no opinion as to which of the schemes is the better, in that the choice must be governed by domestic considerations of finance, time and so on, but both types of apprentice are badly required in the industry and both would have equal opportunity for advancement to positions of senior responsibility. The two-year scheme has the advantage that the year spent in pre-graduate training would permit of an apprentice being able to form an opinion upon his liking of engineering and if need be, allow a change in vocation before too many of his early years have gone by or before he enters upon more serious study. Space will not allow of more than an abstract of the report to be published in this issue, but it is urged that the industry study in detail the particulars we give, for there appear to be in the Committee's recommendations, means whereby the intake of much needed technical man-power in the industry can be substantially increased.

Deferment of National Service

IN view of the publication this week of the report of the Joint Committee which has been considering the practical training of professional electrical engineers, a new edition of the conditions attaching to the deferment from military service of apprentices and students taking full-time courses in certain technical colleges, warrants careful study. The I.E.E. has considered these conditions in all their aspects and has sent us a statement based on a memorandum by the Ministry of Labour. In brief, deferment beyond the age of eighteen may be granted under certain conditions to student-apprentices in, and other students of, engineering to enable them to complete a course of preparation, extending over a period of not more than five years, designed to fit them for employment in a professional grade—but application for deferment must be made on form N.S.294, obtainable from the local office of the Ministry and be supported by the applicant's employer. The I.E.E. document is 5900/78 and its details should be studied with care.

Nationalisation and Cables

SPEAKING at Henley's annual meeting last week, Sir MONTAGUE HUGHMAN, chairman, expressed the hope that when the electricity supply industry passed to State-ownership cable manufacturers would be allowed to work as at present. Nationalisation might have far reaching effects on his company, he said, as there might be one authority acting as buyer for the bulk of the company's home production. On controls, Sir MONTAGUE declared that he believed the Government's intention was to remove these as supplies became more plentiful, but on the subject of coal, he expressed the view that it was one of the major tragedies of modern times that we had got to the point where the Government had to ask certain users of coal to revert to oil-burning if possible. If this country were not to fall to a second or third class power, ample coal by some means or other must be brought up, not only for home consumption, but for export. The oil importers had enough work on their hands to supply special needs, and it was a terrible thing to realise that in reverting from coal to oil, as many firms were compelled to do, we were increasing our imports. There was, continued Sir MONTAGUE, nothing in his remarks to be read politically, but he thought it was imperative for the safety of our future that the coal underground in abundance,

should be brought to the surface in sufficient quantities for home use and for export.

Load Staggering

ATTENTION was drawn in THE ELECTRICIAN last week to the urgency of devising some means of flattening the national peak loads next winter, in order to save load shedding even more serious to industry than was that experienced last winter. As if in answer to our appeal the Government are now considering the possibilities of staggering industrial working hours. In last week's issue also, we suggested that the seriousness of the generating plant position was not sufficiently appreciated, and confirmation of this point of view is given by the fact that the Government are finding it necessary to consider what action can be taken against firms which refuse to co-operate in regional arrangements. What industry generally, seems unable to realise, is that unless there is some arrangement whereby the demand on the national generating plant capacity is kept to within a given maximum, blocks of industrial areas all over the country will be denied electricity supply whether those areas like it or not. Without that limitation on demand the generating capacity of the whole country would be dangerously overloaded, and the national plant put into jeopardy. With the co-operation of industry and its willingness to stagger working hours, however, these conditions would be avoided, and load shedding, if not eliminated altogether, would certainly be less serious.

The Fused Plug

THE publication by the B.S.I. of the specification with respect to the 13-A fused plug and shuttered socket will have brought to a conclusion a certain amount of the controversy which has permeated the industry over a number of years, but it will not eliminate it altogether. That this is so is shown by the remarks of "Supervisor" in this issue, who draws attention to some of the confusion which still exists and must remain while there is a multiplicity of plug and socket connectors of various ratings and types. Many of the housing schemes being carried out, many of the block dwellings being built are to be wired with accessories conforming to the old specification on the one hand and with accessories designed in anticipation of the new specification on the other. In these circumstances accessories designed both to the old as well as the new specification will have to be made, and with the shortage of material and labour prevailing, the supply position may worsen. That the new specification will, in time, take precedence over the old, is not at issue, but since manufacture to its design is at present likely to be difficult where materials are concerned, it is suggested that the new plug and socket may not be altogether welcome at this stage.

For American Consumption

MEMBERS of the Edison Electric Institute were recently addressed by Brig.-General WADE H. HAYES on the subject of nationalisation of the electricity supply industry, in such a way that though few would perhaps find fault with the generalities expressed, the overall picture was one of gloom. One of the difficulties with such addresses is that when they are given in the U.S.A., there are few in that country intimate enough with supply conditions obtaining here, to be able to separate opinion from fact. Whether one agrees with nationalisation or whether one does not, it must be understood in the U.S.A., as it is here, that the technical enthusiasm which has made the British supply industry an example even to America, is in no way related to politics and is not likely to be checked by them. The lead which the British supply industry has established over its counterparts in other countries is based upon engineering experience the world over, and though in the future the administration of the industry may be different, its technical framework, the high qualifications of its personnel, its pioneering spirit and ability to overcome operational problems—of which the supply industry in the U.S.A. can, on account of its geographical position in relation to the late war zones and its adequate coal and plant supplies have only read—will remain the same. The supply industry of this country has abounding confidence in itself and the future, and intends to make further progress under nationalisation or any other administration.

Portrait—Mr. E. T. Norris

FINDING mental relaxation in music and in piano playing, Mr. E. T. Norris, chief engineer of the Transformer Department of Ferranti, Ltd., has in other mood made many outstanding contributions to electrical engineering, while he maintains his physical fitness in winter by cross-country running, and by sailing and playing tennis in summer.

Educated at Yarmouth College, Great Yarmouth, of which his father was headmaster, E. T. Norris, after passing London University matriculation, gained an open scholarship at Finsbury Technical College, where he completed a two years' course in electrical engineering. His early practical training was with the British Westinghouse Co., Ltd., from 1915 to 1917, and while there he attended the Manchester College of Technology and obtained the associateship. He served with the R.E. Signals from 1917 to 1919, and on being demobilised took the position of transformer designer with the Metropolitan-Vickers Electrical Co., Ltd.

In the following year he went to Ferranti, Ltd., as chief assistant transformer designer, and within two years became chief transformer designer and had completed the design of the first 500 000 V transformer to be built in this country, to be followed three years later by apparatus producing, for the first time in Great Britain, 1 000 000 V r.m.s. In 1928 he designed the first British 1 000 000 V testing equipment, forerunner of the building of four 1 000 000 V and three 500 000 V h.v. laboratories in this country. The largest power transformer built for the C.E.B.—one of 75 000 kVA—was designed by him in 1929, with a 50 000 kVA self-cooled rating, the biggest of its type in the world. Later work included a 80 000 kVA power transformer—another world record at the time. He then began work on the invention and design of the moving coil voltage regulator. During the war large numbers of these regulators were supplied to the Services.

In 1927 Mr. Norris was made responsible for the direction of the development of the technique of h.v. surge production and recording, followed progressively by the direction of research and development associated with the automatic control of industrial processes, h.v. electrostatic precipitation and radio frequency industrial heating. Other developments were his invention and design of the Astatic voltage relay in 1934, and the invention and design for the Air Ministry of high-speed voltage regulators for short-wave radio transmission, which he commenced in 1936.

Mr. Norris is a member of the I.E.E. and its Council, and was Chairman of the Transmission Section for 1945-6 and is this year Chairman of the North-Western Centre. He is also a member of the "Mechanicals" and of a number of committees of the E.R.A. and the B.S.I., and a fellow of the American I.E.E. For some years he was a part-time lecturer at the Manchester College of Technology. He is the author of eight papers and addresses read before the I.E.E., of one paper for the American I.E.E., and of over 200 papers and articles published by the British and foreign technical Press. Over forty contributions have appeared in THE ELECTRICIAN.

He was a British delegate to the International Electrical-Technical Conference at Paris in 1932, Prague, 1934, The Hague, 1935, Paris, 1937, and Torquay in 1938; and he was a member of the International H.T. Conference in Paris from 1929 to 1939 and last year.

Married in 1925, Mr. Norris has three sons, the eldest of whom has just commenced farming.

MODERN SUPERTENSION CABLES

by C. C. BARNES, A.M.I.E.E., A.I.I.A

Part I of this series reviews briefly, standard designs of screened type power cables for voltages up to 66 kV. Subsequent articles will deal with the various cable designs developed to suppress ionisation and permit the use of high maximum electric stress in order to reduce the insulation thickness and minimise cable weights and dimensions.

THE steady demand for progressively larger blocks of power due to the increased mechanisation of industry and the application of electricity to railways, mines, factories and the domestic sphere coupled with the use of buried cables for many purposes where overhead transmission lines were hitherto used, have resulted in the development of insulated cables capable of operating at progressively greater voltages.

B.S. 480:1942 (Paper Insulated Cables for Electricity Supply) provides design data for belted, screened, and S.L. (separate lead) type cables for voltages up to and including 22 kV working pressure, but at the present time there is no British standard available for higher voltage cables. The term " supertension " is applied to voltages above 22 kV, and the following notes review briefly the various types of such cables available.

Belted type cables, as used for 22 kV and lower voltages, have proved to be unsuitable for 33 kV operation, since the three-phase field is distributed in an irregular manner over core insulation, belt insulation and worming material in the interstices between the cores, due to the lack of uniformity possible when the insulation is applied partly on the cores and partly over the assembled cores, after they have been wormed into approximately circular section by means of jute or paper packing in the spaces between the cores.

Thus in the belted cable the direction of the lines of electric stress is continually changed in accordance with the voltage distribution on the conductors, so that at any instant they are parallel to some surfaces of the paper layers, or have components in that direction (tangential stresses).

The electric strength of the laminated cable dielectric along the layers (i.e. tangential to the paper tapes) is only approximately ten per cent. of the radial electric strength, and the effect of this pronounced tangential stress is to produce local discharges, known as ionisation, thereby adding to the copper losses a further source of power loss, which in time tends to form carbonised paths in the dielectric which may eventually lead to breakdown of the cable.

Another form of ionisation is due to voids[1]*, or gas pockets within the dielectric resulting from imperfect impregnation, bending of the cable during processing and installation, varying load cycles, or overheating of the cables. Owing to their lower permittivity the stress in these voids, or pockets, is three or four times greater than in the surrounding dielectric, so that the breakdown strength of cable showing such voids is greatly reduced.

The maximum electric working stress used for early designs of power cables was less than 20 kV/cm., well below the breakdown strength of any air occlusions in the insulation. Such cables were satisfactory for voltages up to 11 kV but resulted in bulky and expensive cables for greater service voltages, consequently it became necessary to increase the maximum stress, which was raised to about 30 kV/cm. and later to the order of 40 kV/cm. for 33 kV cables.

Modern supertension cables (see Fig. 1) are invariably of the " screened " type in which each individual conductor and its enveloping paper insulation is surrounded by an earthed electrostatic screen comprising metallised paper or thin copper tape so that the lines of stress are radial. The screened or " H " type construction which was patented by Hochstadter in 1914 results in the voltage gradient being confined to the paper insulation on the cores, and in maintaining a uniformly radial stress in the cores, thereby avoiding tangential stresses.

The screened type cable is available in three forms:—

1. *Single Core Screened Type*, used on installations where armouring is not required, e.g. power station cabling or where the conductor section is such that a three-core cable would be inconveniently heavy. When three single cables forming a three-phase circuit are buried in the ground they are normally installed in triangular formation (apex upwards) and bound together at regular intervals; in other applications they are supported on cleats.

2. *H.S.L. Type*[2].—In these the paper-

* The final article of this series will provide a detailed bibliography.

insulated cores are screened and individually lead-covered and taped; the three cores are then laid up, the assembly being wormed into circular section with compound jute roves, armoured and served overall. H.S.L. type cables may be steel-tape armoured, as the interstices between the cores can be employed for housing reinforcing strands in order to provide longitudinal strength, but the usual practice in this country is to use wire-armoured multicore screened type cables. The separate lead sheaths of the "H.S.L." type cable results in induced sheath currents, but the resulting losses are small and this form of construction is very convenient for jointing and terminating.

3. *"H" Type Cable.*—In common with the "screened type" cables already mentioned the conductors in the "H" type cable are insulated with the full thickness of insulation required between core and earth itself and screened, the cores are then twisted together to form a three-core (phase) cable. This cable has no belt insulation and the interstices between the cores are filled with paper pads, the assembly is then bound together with a cotton tape having copper wires in the weave, in order to maintain electrical contact between the electrostatic screens and the lead sheath which is earthed. The "H" type construction gives the smallest overall diameter for a given copper section, but is not always so convenient to terminate and joint. There is little to choose between the performance of the "H" and "H.S.L." types, and the choice is usually a matter of individual preference.

Current British and American maximum conductor temperature-limits for screened type cables for the voltage range 33 kV to 69 kV are compared in Table 1. Table 2 gives design data for standard 33 and 66 kV single core paper insulated cables made in this country, and comparative data from the relative American specification are included[3].

Several standard American copper sections have been omitted in Table 2 in order to make the comparison between the two ranges of copper conductors as simple as possible. An important difference in these two sets of standards is the American practice of reducing the dielectric wall with increasing conductor size, whereas the British standards have a steadily increasing thickness of paper insulation on the larger copper conductors.

The corresponding British practice for 33 kV three-core "H" and "H.S.L." type cables is to apply a radial thickness for dielectric of 0.325 in. for the normal range of conductor sections.

The data relative to British designs are representative of cable-makers' practice during the past fifteen years, but to-day manufacturing experience and long-term investigation into high voltage phenomena has reached the stage at which these dielectric thicknesses can safely be reduced.

Modern 33 kV screened cables are therefore designed on a maximum electric stress

TABLE 1

Maximum Conductor Temperatures for Screened Type Cables

British practice						American practice			
	Permissible temperature rise (°C.)			Maximum permissible core temperature (°C.)			Permissible temperature rise (°C.)		Max. permissible core temp. (°C.)
Single core	Laid direct	In air	In ducts	Laid direct or in air	In ducts	Single core	In ducts	In air	In ducts or in air
Single core 33 kV and 66 kV oval conductors	50	40	35	65	50	35 kV (phase-phase)	50	30	70
						46 kV (phase-phase)	43	23	63
Single core 33 kV and 66 kV round conductors	45	35	35	60	50	69 kV (phase-phase)	40	20	60

Multicore	Laid direct	In air	Armoured	Unarmoured	Laid direct or in air and armoured cables in ducts	Unarmoured cables in ducts	Multicore	In ducts	In air	In ducts or in air
Multicore 33 kV	50	40	50	35	65	50	35 kV (phase-phase)	50	30	70
33 kV HSL (separate lead type)	45	35	45	—	60	—	46 kV (phase-phase)	43	23	63

British practice is based on an (assumed) ground temperature of 15° C. and normal ambient air temperature of 25° C. The three main installation methods are :—

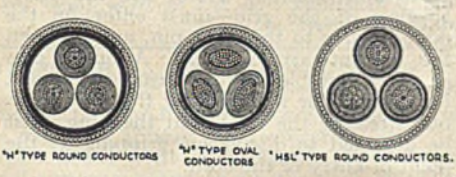
1. Laid direct in the ground.
2. Run in free air.
3. Pulled into ducts.

American practice allows for an (assumed) ground temperature of 20° C and normal ambient air temperature of 40° C. The two main installation methods are :—

1. Pulled into ducts.
2. Run in free air.

of about 40 kV/cm. resulting in a radial thickness of 0.315 in. for a three core cable of 0.10 sq. in. copper section.

On the basis of maximum stress and utilising dielectric radials as quoted above there is no justification for increasing the dielectric wall with increasing conductor



Examples of some solid type paper insulated screened cables

section, and the minimum recommended thickness for the larger copper sections is 0.280 in. radial.

Corresponding dielectric wall thickness for single core 33 kV, screened type cable is 0.335 for 0.1 sq. in. copper section tapering down to 0.30 in. for the larger copper sections. When using maximum stress as a basis for computing the dielectric thickness no correction is normally made for the effect of stranding, furthermore the same dielectric thicknesses are used for both circular and oval conductor cables.

Above 33 kV, the weight of three-conductor screened cables tends to become excessive and they have to be made in relatively short lengths and then wound on drums having large diameter centres; 66 kV screened cables are usually single core mainly because they can be manufactured and handled in longer lengths than the three-conductor cable, thereby minimising joints.

Except for very short runs of single-core cables the installation is bonded at both ends, which introduces sheath losses on a.c. systems, and such installations are not protected with the normal ferrous armouring except for very small copper sections (e.g., 0.06 sq. in. and smaller sizes).

Where it is essential that single-core cables of larger copper section are wire armoured, various types of non-magnetic armouring materials are available[4], but these materials make the cable expensive and the advice of the cable-maker should always be obtained when this problem arises.

For 66 kV, and particularly for higher voltages, the mass impregnated and screened type cable tends to become uneconomical, and special cables have been developed which permit a higher maximum stress and consequently a reduced thickness of insulation.

When it is realised that the instantaneous breakdown value of the impregnated paper used for the conductor insulation is in the neighbourhood of 400 kV/cm. and the long time breakdown value about 160 kV/cm., it is clear that the screened type construction results in very inefficient utilisation of the insulating medium for the higher operating voltages.

Appointments Bureau

In order to obviate any possibility of its name being infringed, the Professional Engineers' Appointments Bureau has been incorporated as a company under limited guarantee. The scope of the bureau remains unaltered and readers who, by reason of their engineering qualifications, belong to the I.C.E., the I.Mech.E., or the I.E.E., or persons whose engineering qualifications for election or admission to one of those bodies have been approved by the respective councils, are invited to register with the Registrar of the Bureau, at 13, Victoria Street, Westminster, S.W.1. Employers are invited to submit concise details of vacancies.

TABLE 2

Thickness of Dielectric and Lead Sheath for Single Core Cables
Centre Point Earthed Only (Grounded Neutral)

Nominal area of conductor (sq. in.)	British practice*		Area of conductor			American practice†		
	33 kV	66 kV	Circular mils	—	sq. in.	27 kV	33 kV	69 kV
0.06	0.40/0.10	—	105 500	—	0.0828	0.315/0.090	0.395/0.090	—
0.10	0.40/0.10	—	133 100	—	0.1045	0.305/0.090	0.385/0.090	—
0.15	0.40/0.10	0.65/0.14	211 600	—	0.1661	0.285/0.090	0.355/0.100	—
0.20	0.40/0.11	0.65/0.14	250 000	—	0.1962	0.275/0.090	0.350/0.100	—
0.25	0.40/0.11	0.65/0.14	350 000	—	0.2747	0.275/0.100	0.345/0.100	0.650/0.120
0.30	0.40/0.11	0.65/0.15	400 000	—	0.314	0.275/0.100	0.345/0.100	0.650/0.120
0.40	0.40/0.11	0.65/0.15	500 000	—	0.3925	0.275/0.100	0.345/0.105	0.650/0.120
0.50	0.45/0.12	0.65/0.15	600 000	—	0.471	0.275/0.100	0.345/0.105	0.650/0.125
0.60	0.47/0.13		800 000	—	0.628	0.275/0.105	0.345/0.110	0.650/0.125
0.75	0.50/0.14		1 000 000	—	0.785	0.275/0.105	0.345/0.110	0.650/0.125

* Thicknesses are minimum values.

† Thicknesses are average values and minimum thicknesses must not be less than 90% of the values specified above.

13A Fused Plug and Socket

Requirements of New B.S. Specification 1363

STANDARDISATION of the new 13 A fused plug and socket outlet took place, at the beginning of the month, with the publication of British Standard Specification 1363 : 1947, " for two-pole and earthing-pin fused plugs and shuttered socket outlets for circuits up to 250 V." It will be remembered that the Ministry of Works Report on " Electrical Installations " (Post-War Building Studies, No. 11), stated that the recommendation for ring circuits necessitated the introduction of a 13 A fused plug. Subsequently, the recommendations were considered by various committees, including the I.E.E. Wiring Regulations Committee, and the final conclusion, of which the present specification is the result, was that a new type of " all-purpose " 3 kW fused plug and shuttered socket outlet should be standardised for domestic purposes.

The new specification points out that B.S. 196 : 1930 (two-pin plugs and sockets with earthing connections) and B.S. 546 : 1934 (two pole and earthing pin plugs and sockets for 2, 5, 15 and 30 A) remain in force for extensions to existing installations, or where a 30 A rating is required.

After a definition of terms, in which it is stated that plug pins shall be of rectangular cross-section, the specification begins by requiring that no part of a current-carrying plug pin shall be less than 0.312 in. from the periphery of the face of the plug, while, among other precautions against accidental contact by the user, is the stipulation that when the plug is withdrawn the current-carrying socket contacts are automatically screened by shutters not operated solely by insertion of the current-carrying pins. The earthing pin must make and break contact with its socket before and after, respectively, the current-carrying pins make and break with their socket contacts.

The fuse link (to B.S. 1362) is to be contained within the body of the plug, and mounted between the line terminal and the corresponding pin in such a way that it cannot be displaced when the plug is in use. Similarly, the plug is to be strong enough not to fracture in the event of the link bursting in service.

Details are then given of the construction of pins and terminals within the plug, and it is required that insulating barriers, forming an integral part of the plug, shall be provided to separate metal at different potentials, including bared flexible conductors within the plug. The flexible cord, which must be gripped effectively—a later paragraph specifies a test for the effectiveness of the grip—must enter on the opposite side to the earth pin, and between the current-carrying pins. A finger grip or other suitable means must be provided for inserting or withdrawing the plug without stressing the cord, and the plug must be designed to discourage gripping at the point of entry of the cord.

Regarding materials, the specification requires that ferrous metal parts shall be rust-proof, while the base and cover of plug and the socket outlet plate and shutter must be of tough non-ignitable insulating material and the socket outlet base of a vitrified ceramic.

In the socket outlet, the contacts must be self-adjusting, and the means for producing contact pressure are to be associated with each contact independently. Means are to be provided for earthing the socket-contact to the outlet box automatically, and the holes in the socket plate are to be chamfered at their front edges to facilitate pin insertion.

Detailing type tests, the specification requires that the plugs and sockets shall break a current of 17 A in an a.c. non-inductive circuit, this test being performed by withdrawing the plug at a speed of 6 in/sec. ten times at intervals of 30 secs. Temperature rise on any terminal must not exceed 35° C. after sufficient time has elapsed for the temperature to become steady. The withdrawal pull of a plug from a socket outlet must be not less than 1½ lb. and not more than 8 lb.

Three sampling tests are also specified. The first concerns minimum withdrawal pull from an individual socket outlet (not less than 8 oz.), or alternatively, the maximum voltage-drop between an individual contact and the corresponding pin, measured from terminal to terminal, shall be 12 millivolts at 13 A. Each plug and outlet must, also, pass an insulation resistance test of at least 100 megohms, measured at not less than 500 V d.c., while the a.c. flash-over test must be passed at not less than 2 000 V, 50 cycles. Both the latter tests are to be applied between line and neutral terminals and between terminals and other parts insulated from them.

Plugs must be marked with the word " fused " on the outside of the cover, so that it is always visible when the plug is in engagement with the outlet. Sockets must be marked with their current rating of 13 A.

DOMESTIC WIRING PROBLEMS

by "SUPERVISOR"

In the article below are discussed some of the reactions to the standardising of plugs and sockets, followed by a short critical review of the 13-A fused plug and shuttered socket dealt with in the now-published B.S.S. 1363. Details of the new specification are given on the preceding page.

FURTHER to my notes last month regarding the construction of the new standard plug and socket, many installation engineers appear to be concerned and worried about what is the future position —will the new standard be the only one to be taken into account for all new domestic installations, or will it be permissible to continue to instal plugs and sockets to B.S.S. 546, and if so, what becomes of standardisation? The writer has taken part in several discussions on the point, which had at best to be mere expressions of opinion, for official or semi-official pronouncements made no contribution towards a solution.

Going back to the start of the business, the Appendix to Post-War Building Studies No. 11, Electrical Installations, para. 1, simply states that consideration had been given to the provision of a standard "all-purpose" socket-outlet and plug for domestic purposes. Nothing whatever is said as to the desirability or otherwise of this new standard completely superseding existing standard socket-outlets and plugs, but it seems difficult to imagine that the Committee were thinking merely of just another socket-outlet, to be tacked on to the list of existing types.

It is important to note the word "domestic" in the Committee's report, as it is being argued in some quarters that the new standard is unsuitable for industrial purposes. Clearly, the new standard was never contemplated as suitable for use in such installations, although many will probably find their way there. It would seem, therefore, that the existing range will be continued, if only for industrial use, and it must be agreed that the standardisation problem is less acute in that direction than it is in the domestic sphere.

The March, 1946, Supplement to the I.E.E. Regulations makes it clear that although the new 13-A socket-outlet and plug is permissible on ring circuits and under certain other conditions, it is also permissible to continue to instal socket-outlets and plugs under the existing standards and under existing regulations. It is, of course, possible that some amendment may be made now that the officially-approved standard is available.

Some slight lifting of the curtain may be discerned in the draft of the British Standard Code of Practice, Electrical Installations (General), in its reference to socket-outlets. Para. 305, Arrangement of Final sub-circuits (c), says—"Socket outlets in domestic premises should be of the fused plug type of 13-A rating and these may be served by a ring circuit having a conductor of cross-sectional area of not less than 0.0045 sq. in., the circuit being protected by a fuse on the consumer's supply control unit or distribution fuseboard, both ends of the ring being brought into the fuse terminals. But every appliance served from such outlets should be protected by a suitable fuse incorporated in the plug."

The remaining sub-clauses make no reference to any other type or size of socket-outlet, from which it may be concluded that the compilers had no intention of using anything else in the domestic installation than the new 13-A rated socket-outlet. Whether or not the final approved draft is issued in the same form remains to be seen, as no doubt some pressure will be brought to bear.

It will be noted that in the above-quoted sub-clause, no definite reference is made to the capacity of the fuses to be inserted into the plug, or even if there are to be any rated differently from the 13-A socket. The final sentence refers to a "suitable" fuse, and here opinions are likely to differ. One manufacturer claims "The New Standard Domestic Gauge," with plugs fused to 3, 7 or 13-A as required, but we shall have to wait and see the fuse performances of these plugs, and under what standard they are constructed, before any really serious comment can be made.

However, a preliminary and purely personal view may be advanced here, based upon extended use with existing types of 13-A socket-outlets with fused plugs, and which have fuses rated at 3 and 13-A. It is found in practice that the 3-A fuse is never used, reliance upon the 13-A fuse being complete, and, so far, perfectly justified. In seeking the reasons for the disuse of the smaller fuse the following points were elicited, and which are apparently so widely agreed that the

makers of the socket-outlet are now discontinuing the supply of the 3-A fuse.

One of the main reasons advanced for the discard of the 3-A fuse is that, when two sizes are supplied the consumer is liable to use the smaller fuse for a 2 or 3 kW radiator, and wonder why the fuse blows. Obviously, when he finds out, he uses nothing but 13-A fuses from then on, as he can hardly be expected to appreciate the finer academic points behind the provision of the smaller size of fuse. Further, in practice, domestic appliances do not become overloaded; faults are either in the connecting flex' or the appliance, and are almost invariably short-circuits. Closer protection than that provided by means of an efficient 13-A fuse is, therefore, unnecessary.

The point is then raised—what about electric clocks and other very small current-consuming appliances? Assuming that a clock takes 5 W and is protected by means of a 3-A fuse blowing at 4½-A, it is still 200 times overloaded before the fuse blows. There would appear to be equivalent protection with a 13-A fuse which blows in 0.0006 second, in fact considerably enhanced protection over common practice which permits the consumer to rewire a fuse with any handy material.

Provided, therefore, that a fuse with a really satisfactory performance is incorporated in the new domestic standard, the writer suggests the use of one size only, in order to avoid further consumer-confusion and to increase the degree of standardisation.

The many advantages of a standard can be vitiated if the consumer still has three fuse sizes to plague him, and however desirable such close protection may be when rewirable fuses are used, there can be no real practical necessity for it with modern enclosed fuses to the standard desired, and which are available.

THE NEW STANDARD

Since the above notes were written, B.S.S. No. 1363/1947, dealing with fused plugs and shuttered socket-outlets for general domestic use and similar purposes, has been published. This lengthy and thorough publication deserves close attention, but it will be considered here only in so far as it answers the queries in the above paragraphs.

The new specification does not supersede Nos. 196/1930 and 546/1934, and plugs and sockets to these standards are to remain available. The enclosed fuses are, however, to what is, to the present writer, a new standard, No. 1362, and will be of all ratings up to 13-A. Otherwise there are no unexpected details and we shall have to await availability before the necessary practical tests can be made, and upon the results of which alone the adoption of the new standard will rest.

SOME OBJECTIONS

As might be expected from previous notes, however, the present writer detects certain objections to the new standard, but these will be only briefly mentioned. The first is, having to take the plug to pieces to get at the fuse, and having to use a screwdriver for this purpose. Then there is the possibility of bridging the fuse-clips with something other than the approved cartridge fuse, and with the consumer actually handling the fuse-holder on short-circuit this may be a serious matter.

The plate and plug appear to be about the same size as the existing B.S.S. 546 15-A plug, which is usually considered to be unduly clumsy for domestic work. This was to be expected, however, with the incorporation of the fuse within the plug, and is unavoidable. Another objection is that the new standard socket-outlet requires a special iron or steel box, as it will fit none of the existing range, and only a contractor can fully understand just what that means. The present specification covers only unswitched sockets, and we have to wait still longer for a combined switch-socket-outlet.

Apart from these points which arise from a perusal of the specification, there seem to be other difficulties ahead. For instance, it may be 18 months or a couple of years before socket-outlets to the new standard are available in the quantities required for housing drives, and what are we to do about ring-main circuits in the interim? It would seem from the thorough specification that the new job is going to be quite expensive—one manufacturer has estimated the net trade cost as 15s. each—but this of the future.

Apart from these pessimistic utterances, however, the present writer will attempt to approach the matter of adoption of the new standard with an unjaundiced eye and unbiassed mind, and find out what the new socket-outlet can do on the job, which is, after all, the main consideration. The equipment that was used to test other types is still available, and will be used for the new pattern.

The Parliamentary Secretary to the Ministry of Fuel and Power has stated that during 1946 there was a net transfer of power from Scotland to England of 47 million units. The maximum power transfer was 146 000 kW from Scotland to England (which occurred from 9 to 9.30 a.m. on March 14) and 80 000 kW from England to Scotland (from 10.30 to 11 p.m. on December 30).

PRACTICAL TRAINING of ENGINEERS

RECOMMENDATIONS FOR PRE-GRADUATE WORKS EXPERIENCE

IT will be remembered that the I.E.E. published in April, 1943, a report entitled "Education and Training of Engineers,"* which reviewed existing systems and suggested a number of proposals for improvement, while a second report dealing with part-time further education was published later.*

THE JOINT COMMITTEE

In October, 1945, there was convened at the instigation of the I.E.E. a Joint Committee on Practical Training in the Electrical Engineering Industry, consisting of representatives of the B.E.A.M.A., the Radio Industry Council, and the I.E.E., to review the existing methods of practical training in the industry with special reference to those who desire to become professional engineers and technicians; to enumerate the essential features of schemes of practical training and the steps which should be taken to encourage the adoption and application of these schemes; and to prepare recommendations.

The Committee was made up of:

Sir Arthur P. M. Fleming, Mr. H. J. Allcock, Mr. D. A. Bell, Mr. J. E. Calverley, Brig. F. T. Chapman, Mr. W. N. C. Clinch, Mr. Kenneth R. Evans, Mr. T. E. Goldup, Mr. S. E. Goodall, Mr. C. Grad, Mr. D. B. Hoseason, Prof. Willis Jackson, Principal J. C. Jones, Capt. J. Legg, Mr. F. R. Livock, Mr. N. C. Stamford, Mr. S. Austen Stigant, Dr. R. C. G. Williams (later resigned), with Mr. M. W. Humphrey Davies as technical officer and Mr. W. K. Brasher as secretary.

The report, which was published on Monday, contains recommendations for the provision of two types of professional apprenticeship, one of two years for apprentices who obtain their technical education by full-time study and another of four years for those who follow part-time courses. A good secondary education is necessary for entry to either scheme. The apprenticeships are intended to provide only the general practical training that is necessary and those who have completed the courses should subsequently be given functional and specialised training in the branch of work upon which they are employed. The report also contains proposals concerning courses of study which should be provided for apprentices and refers to social and other activities organised by the apprentices themselves. Although the schemes of training may appear ambitious to many of the smaller firms, all but the smallest concerns should be able to devise satisfactory schemes of training provided they can secure the co-operation of other engineering firms.

After reviewing the branches of industry in which professional electrical engineers are employed, the report points out that problems seldom present themselves in industry in terms which suggest their own solution, and the engineer must be sure that he obtains a complete statement of his problem. He must then seek much of the data for its solution and ensure that this is practicable. Textbooks and published tables of data will not usually provide the required information, which will be peculiar to the materials and methods that are or may be used in the branch of the industry concerned or are available to a particular firm or organisation. If he is to be qualified to solve such problems in a practical manner the professional engineer must be thoroughly acquainted both with the techniques and processes which find common application, and with those directly relevant to his particular branch. It is not necessary that he should himself be skilled in the detailed performance of these processes, but it is essential that he should understand their potentialities and limitations. Such an understanding can be acquired only by direct association with the processes and with those who perform them, and its development is the primary object of the systems of practical training discussed in the report. This training can generally best be obtained in a manufacturing organisation.

TWO AND FOUR YEAR SCHEMES

Appropriate schemes for obtaining such practical training are outlined in the report. The first is a two-year scheme called a graduate apprenticeship and intended for those who take a full-time course of technical education; for most candidates it would be preferable for the first year of the apprenticeship to be served immediately the candidate leaves school and before he starts his main course of technical education. This preliminary year may be called a pre-graduate apprenticeship. A second and four-year scheme called student apprenticeship is designed for those who propose to follow a concurrent course of part-time technical education. A third type of apprenticeship is possible in which the apprentice spends alternate periods in the factory and at a college. Such schemes are a compromise between the graduate and student apprenticeships, but whatever form a scheme takes, at least twelve months of graduate apprenticeship should, the Committee state,

* THE ELECTRICIAN, May 14, 1943; † THE ELECTRICIAN January 12, 1945

be served after the educational course has been completed.

The main object of a course of practical training is to familiarise the apprentice with: (a) The materials, tools, equipment and craft skill available in modern industry; (b) the techniques and organisation involved in designing, developing, manufacturing, installing and operating engineering equipment; (c) the outlook of the men he will be called upon to control, in one way or another, during his subsequent professional career.

LEARNING FACTS ABOUT INDUSTRY

At the beginning of his training the apprentice's acquaintance with the organisation and scope of the electrical engineering profession is likely to be very limited and such ideas as may have formed in his mind regarding his future career are likely to undergo considerable change as his training and experience develop. Careful observation of the progress of each apprentice is, therefore, essential at every stage of training so that a suitable appointment may be made at the end of apprenticeship. Independent responsibility begins with this initial appointment and although the junior engineer is then no longer under the direct supervision of the training department, continued observation of his progress is none the less desirable.

Schemes of practical training for graduate, pre-graduate and student apprentices are detailed in the report and each scheme may be divided into basic mechanical training, basic electrical training, and office training. The period of basic mechanical training, which occupies nearly half the course, gives the apprentice an acquaintance with workshop methods and processes and with factory organisation. The second period gives him opportunities for widening his knowledge of the properties of materials used in electrical engineering and of the various methods employed in assembling and testing electrical equipment. The final period gives him an introduction to the office work connected with production and design as well as opportunities for indicating his functional ability. Only the larger departments of an industrial concern can accommodate more than two or three apprentices at a time and it will be necessary to utilise a range of alternative departments for most sections of the course. This means that some aspects of the general training must be focused on the problems connected with particular products, but this specialisation must not be too narrow.

The complete course of training suggested by the Committee for those who obtain their technical education by full-time study is planned to last 104 weeks, divided as follows: (a) Basic mechanical training, 44 weeks; (b) basic electrical training, 36 weeks; (c) office training, 24 weeks.

Pre-graduate apprentices should complete as much as possible of their basic mechanical training during their pre-university year, leaving those portions of the course which need fundamental electrical knowledge until they have graduated. As they should be released for part-time study on one day each week during the college year, it might be desirable as compensation to increase the length of the period of basic mechanical training to 52 weeks. The course has been drawn up on the assumption that at least part of the summer vacations during the university period will be devoted to further practical training.

The complete course of training for those who obtain their technical education by part-time study during their apprenticeship should last 208 weeks. The course outlined is modelled on the same principles as the course for graduate apprentices, but it is possible to cover more departments and to spend longer periods in each. The first two years are devoted mainly to basic mechanical training, the third to basic electrical training and the last to office training.

OPERATIONAL TRAINING

In the operation and maintenance of electrical equipment the Committee point out that there are large organisations organisation, it will generally be desirable supply of electricity, the operation of systems of electric traction and the provision of telecommunication facilities by radio, line and cable. Apprenticeships can be provided for entrance to operating concerns, wholly with an operating concern, wholly with a manufacturer, or by means of a combined apprenticeship with both. Those who have completed such apprenticeships will be suitable for initial appointments as junior engineers but, as in the other schemes, further functional training will be necessary and their work should be varied from time to time so that they may obtain a wider experience in operating techniques. While a few operating organisations may be able to provide training for graduate apprentices within the organisation it will generally be desirable for a part of the training to be obtained in a manufacturer's works. It will not usually be practicable for an operating organisation to accept pre-graduate apprentices as that part of the training which is given requires more technical knowledge than such an apprentice would possess.

A graduate apprenticeship scheme to be served mainly with an operating concern

is outlined in the report and provides for a total of 36 weeks with a manufacturer and 68 weeks with an operating organisation. Schemes for the training of student apprentices can be developed on similar lines.

CRAFTSMEN APPRENTICES

Among those apprenticed as craftsmen there will be some who show promise in their technical education, and provision should be made for selecting the best of these for transfer to student apprenticeships. Such transfers should be made as soon as possible after the apprentice reaches the age of 18 years.

There are many small firms who, either because of the small number of their employees or because of the limited range of work available, should not provide schemes of training for graduate and student apprentices. Such firms should concentrate on apprenticeships for craftsmen, giving apprentices of suitable ability a wider training which may ultimately fit them for employment as technicians.

An organised course of study should be associated with every scheme of practical training. Apprentices should be encouraged to develop the habit of collecting technical information for themselves from reference books and journals, and a technical library and reading room should be available for their use in the works or elsewhere. They should be required to attend regular courses provided in the works during working hours, and day and evening courses at technical colleges.

TECHNICAL COLLEGE COURSES

Student apprentices should be released from work on one day a week throughout their apprenticeship to attend courses at technical colleges in order that they may prepare for the Ordinary and Higher National Certificates in Electrical Engineering. They should in addition be required to attend on one evening a week during the session. Pre-graduate apprentices should also be granted part-time day release in order that they may continue their preparation for university entry.

By the end of his apprenticeship the apprentice will have acquired a general knowledge of the problems connected with the manufacture and operation of electrical apparatus and a deeper insight into the design and manufacture of some particular type of equipment. His formal training completed, he will be anxious to obtain a post involving responsibility and both he and his employers will have formed opinions as to the type of work most suited to his interests and abilities. He will be wise if, for a considerable time, he regards his employment as a continuation of his training and he should seize every opportunity for broadening his practical experience and extending his scientific, technical and commercial knowledge. Only through assiduous and constant attention to these matters will he prepare himself effectively for the senior positions which lie ahead. A few weeks before he commences his office training the apprentice should have been interviewed and advised by one or more senior members of the company who are professional electrical engineers. Such an interview affords opportunity for discussing the remainder of his course of training and for helping him to formulate his own ideas for his future on lines that are likely to lead to his advancement.

Copies of the report, "The Practical Training of Professional Electrical Engineers," are obtainable from the I.E.E., price 1s., post free.

Visit to Stourport

MEMBERS of the Cheltenham Electricity Committee recently visited the Worcs. and Staffs Power Co.'s generating station at Stourport, where the 525 000 lb. per hour boiler illustrated in our last issue is being installed as part of the C.E.B. extension programme. They were accompanied by their borough electrical engineer, Mr. R. W. Steele, and were the guests of Mr. D. H. Kendon, general manager of the company.

In the course of a speech, in which he reviewed the extensive rural electrification work carried out by the company, Mr. Kendon said that the area covered by the Stourport station was about 45 acres. Coal arrived partly by rail and partly by canal, the amount of fuel consumed giving employment to 2 000 miners. Fifty five-ton lorry loads of ash had to be disposed of each day.

Over £3 000 000 had been spent on the existing station, and with the first stage of the new extension the sum would be over £5 000 000. The station at present paid over half the rates of the town of Stourport. Although the new buildings were well advanced, Mr. Kenyon explained that visitors would not see much in the way of machinery. The first part of the new station would contain one 60 000 kW, 3 000 r.p.m., hydrogen-cooled set, generating at 11 kV, although switching would be at 66 kV. It would be supplied with steam from one boiler at a pressure of 1 250 lbs. per sq. in. and a temperature of 950° F. The boiler drum would weigh 60 tons, be 36 ft. long, 6 ft. in diameter, and 5 in. thick.

The visitors were conducted round the station by Mr. H. North, power station engineer, and members of his staff.

Electrical Personalities

We are always glad to receive from readers news of their social and business activities for publication in this page. Paragraphs should be as brief as possible.

MR. J. A. WALTERS has been appointed manager of the carbon department of the General Electric Co., Ltd., in succession to Mr. T. Settle, who retired on March 31. Mr. Walters graduated in Chemistry at King's College, London, and after a short time with the South Metropolitan Gas Co. and the Anglo-Scottish Beet Sugar Corporation, joined the staff of the G.E.C. research laboratories in 1928. In 1937 he joined the head office staff of the company under Mr. Settle on the technical side of the carbon department.

MR. J. A. WALTERS

MR. W. R. VERNON SMITH and Mr. C. H. Davy have been appointed directors of Babcock and Wilcox, Ltd.

MR. R. F. HATTO, sales director of S. Wolf and Co., Ltd., has just returned from a successful business trip which took him to the Union of South Africa, Northern and Southern Rhodesia and Kenya. Mr. Hatto expresses the opinion that these long term markets deserve more attention than is being paid to them at present by British manufacturers. This is particularly so in the Union where sellers' market conditions show signs of changing. He emphasises the importance to manufacturers in this country of checking the credentials and business activities of any prospective agent or buyer, and in this connection, he states that the help given to him by the Trade Commissioners in the countries concerned was invaluable; he strongly advises obtaining their opinion before making any business arrangements.

MR. R. F. HATTO

MR. CYRIL C. SCOTT, managing director of Flinders Wholesale Ltd., has been appointed a director of Electrical Components Ltd., of which the former is a subsidiary.

MR. JOHN WALSH, chairman of the Blackburn branch of the E.C.A., and Mr. James Heys, hon. sec., have been presented with silver cigarette caskets by the members, in appreciation of the services to the branch during the war period.

MR. E. E. HOADLEY, borough electrical engineer, Maidstone, on July 10 escorted the Duchess of Kent round the

MR. E. E. HOADLEY *with the* DUCHESS OF KENT *at the Kent Agricultural Show*

stand of the British Electrical Development Association when she visited the Kent County Agricultural Society's show at Maidstone.

MR. W. L. BARBER, chairman of the Midland Electric Manufacturing Co., Ltd., presided at a sales conference at the company's works, attended by the firm's representatives from all parts of the United Kingdom. We reproduce opposite a photograph of a group, taken during the conference, included in which is Mr. James Thornell, the company's Australian representative, who is at present visiting the works.

Mr. W. C. S. PHILLIPS, after 28 years as head of the Department of Electrical Engineering and Physics at the Borough Polytechnic, is retiring at the end of

August. Mr. Phillips was educated at King Edward's Grammar School, Birmingham, and proceeded from there to Mason University College, Birmingham, where he remained for five years and held the Major Rowlinson Scholarship and a Staffs County Council Scholarship. Whilst working for his degree under the direction of Prof. J. H. Poynting, F.R.S., he was encouraged to take up research work in which he has shown a keen interest throughout his career. After obtaining his degree in physics, he continued to take courses in electrical engineering and became a lecturer at the Derby Technical College. In 1907 he returned to Birmingham as a lecturer at the Central Technical College. In 1914 a new wing was opened at the Stoke-on-Trent Technical College especially for electrical engineering work as applied to mining and pottery, and Mr. Phillips was appointed to start the department and to arrange for its equipment. He continued there until 1916 when he joined the Aeronautical Inspection Department. At the conclusion of the 1914-18 war, Mr. Phillips was selected to become head of the Department of Electrical Engineering and Physics at the Borough Polytechnic. Members of the staff yesterday (Thursday) made him a presentation.

MR. J. G. CURTIS has succeeded Mr. D. J. W. Harvey as engineer and manager of Kirkcaldy electricity department.

SIR ALEXANDER ROGER, chairman, and the directors of B.I. Callender's Cables, Ltd., entertained the staff of the Erith Works at a dinner and dance in the Paramount Salon de Danse, London, on July 9. With the exception of Mr. Charles Pipkin, who was unable to attend, all the directors of the company were present. In a short speech of welcome, Sir Alexander said it was intended to hold similar friendly functions at every factory in the group. One of the difficulties in big business was in getting people in different factories and branches to meet together; it was the board's intention to overcome this if possible. They had already tried to do this with the shareholders and met with

SIR ALEXANDER ROGER, MR. E. F. SARGENT, *and* MR. H. HILL *at the B. I. Callender's Erith Works Social*

enormous success when 500 turned up at the company's annual general meeting to be shown round the Prescot factory. Shareholders, staff and workers should, he said, get to know each other, and although it was a big job the board were going to try and do it. Sir Alexander referred to the retirement of Mr. H. Hill, Erith works manager, next year.

MR. H. E. TAYLER, managing director of the British General Electric Co., Ltd., New Zealand, was host, and Mr. and the Hon. Mrs. Leslie Gamage were guests, at a luncheon party given on July 4 by the G.E.C. overseas staff now on visit to this country. Mr. Leslie Gamage, in thanking his hosts, said that the gathering was exceptional as it was representative of the G.E.C. all over the world. Exports had increased in spite of difficulties, but we

Group taken at the Sales Conference of the Midland Electrical Manufacturing Co. Ltd.

had not yet reached the target. He encouraged all overseas members to co-operate in reaching the goal. The Hon. Mrs. Leslie Gamage expressed her appre-

MR. L. C. GAMAGE *addressing members of the G.E.C. overseas staff.* THE HON. MRS. GAMAGE *is on the right*

ciation of the kindness she had received and the friends she had made on her overseas visits with her husband, and hoped at some future date to visit them again.

MR. DOUGLAS S. PARRY has joined the staff of A. Reyrolle and Co., Ltd., and will shortly take up his duties as district manager in Northern Ireland.

MR. J. A. HARLE has been appointed Professor of Electrical Engineering in the University of Alberta, Edmonton, Canada, and is sailing early in August to take up his appointment on September 1. He served his time with C. A. Parsons and Co., Ltd., and studied at Armstrong (now King's) College under the late Prof. W. M. Thornton, graduating with distinction in 1919. He was appointed Lecturer in Electrical Engineering at Armstrong College in the same year, and during the three years he was there he lectured to many students who had returned from the 1914-18 war. In 1922 the late Mr. Clothier invited him to join the technical and research department of A. Reyrolle and Co., Ltd., and he took over the headship of the department in 1937 when he succeeded Mr. B. H. Leeson. Mr. Harle served as chairman of the North-Eastern Centre of the I.E.E. during the session 1944-45, and he has been the institution's area member for the Education and Training Advisory Service for returned Service members. He has taken part in the work of the E.R.A., the B.E.A.M.A., and I.E.C. Committees, being keenly interested in insulation and circuit-breaking problems, both from the research and from the standardisation points of view.

MR. J. A. HARLE

Some 2 000 employees and their friends attended the 13th annual sports and gala of the Victoria Works Athletic Club on the Johnson and Phillips sports ground at Kidbrooke on July 12. A Championship Cup presented by J. Stone and Co., Ltd., to be competed for annually by local firms, was won appropriately by Stones Athletic and Social Club. Competing firms were Harveys Sports, U.G.B. Sports, Stones Athletic, Telcon Sports, Metrogas and Victoria Works Athletic Club. Of the individual competitors, Miss G. Harvey, Miss M. Davison, Mr. S. G. Wood and Mr. A. F. Kemp were outstanding winners. The Inter-Departmental Challenge Shield (presented by the management of Johnson and Phillips Ltd.) was won by the Employment and Welfare Department with a clear majority of 10 points. At the close of the evening, the prizes were presented by Mrs. G. Leslie Wates, wife of the chairman and joint-managing director of the company.

MR. S. S. BAGSHAW, of the B.T-H. Co., Rugby, who produces the B.T-H. Operatic and Dramatic Society shows, has recently received the Long Service Medal from the National Operatic and Dramatic Association for 25 years' continuous service to Dramatic Art. The B.T-H. Operatic and Dramatic Society are now going into rehearsal for "Rebecca" for production in the week commencing October 6 at the Co-operative Hall, Rugby.

MR. VICTOR C. H. CREER, has been appointed general manager of the B.T-H. lamp and lighting sales department. Mr. Creer, who was born in Australia, has had experience on the London Stock Exchange and was an executive in the film industry for many years. On the outbreak of war, Mr. Creer became an administrative officer in the Ministry of Economic Warfare, and was afterwards transferred to the Air Ministry. He later became well-known to many executives in the lamp industry as Deputy Director of Lamp Production at the Ministry of Aircraft Production. He joined the lamp and lighting department of the B.T-H. Co., in October, 1945, as assistant to Mr. H. A. Lingard.

MR. V. C. H. CREER

The Public Works Exhibition

Some Recent Street Lighting Developments

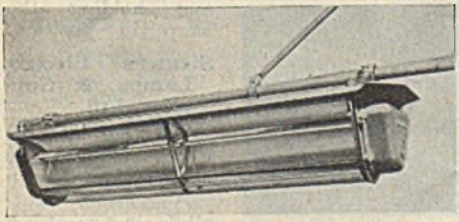
THE Prime Minister, Mr. C. R. Attlee, will open the eleventh Public Works, Roads and Transport Congress at Olympia on July 21. The Minister of Health, Mr. Aneurin Bevan, will take the chair as president of the Congress. Thereafter, the proceedings will continue until July 26.

The first to be held for ten years, the 1947 Congress will, it is expected, attract considerable attention, and over 1 000 delegates have been appointed by local authorities to attend. Some 20 papers on various aspects of public works are to be delivered, of which that to be presented by Mr. N. Boydell under the auspices of the Association of Public Lighting Engineers will be of interest to the electrical world. It is entitled "The Development and Trend of Street-Lighting by Electricity," and the conference which will follow will be under the chairmanship of Mr. W. N. C. Clinch, president of the A.P.L.E.

The exhibition, which is to be open to the public from 10.30 a.m. to 6.30 p.m. daily (admission 2s.), will be supported by 130 manufacturers. Short descriptions of some of the electrical and allied products which will be on show are given below.

Automatic Telephone & Electric Co., Ltd.

The general title "A.T.M. Automatic Electric Signalling Systems," will cover four sections featuring a number of products. In the one concerned with traffic signals, a large pictorial diagram will demonstrate

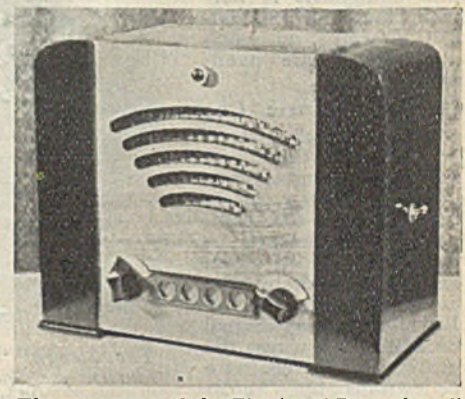


The B.T-H. "Mazdalux" fluorescent street-lighting lantern

the various phases of traffic movement at the complicated "Bank Complex" intersection in London—the most recent "Electromatic" vehicle-actuated signal installation. In another an illuminated map showing the location of important electric installations throughout the country and, operated by a standard "Rythmatic" control panel and relays, will illustrate the effectiveness of the equipment. A third section will deal with the company's equipment for remote control, indication and metering, and in a fourth will be demonstrated the A.T.M. closed circuit system for fire alarms and ambulance calls.

British Thomson-Houston Co., Ltd.

The equipment to be displayed reflects the great advances made in lighting technique during recent years. Mazdalux lan-



The master set of the Fleming "Descaphone" apparatus

terns to accommodate many types of street-lighting lamp are to be exhibited, including the fluorescent three-lamp lantern; a new range of sixteen side entry lanterns; a horizontal enclosed lantern designed for standard 250 W or 400 W Mazda mercury vapour lamp, with controlled cut-off; new "Rural" and "Parish" lanterns; a new area floodlighting unit, the Mazdalux "10," for illuminating marshalling yards, dockyards, car parks and all kinds of outdoor working areas. Examples from a new range of fittings for use with 40 and 80 W fluorescent lamps are to be shown. One is designed to resist the corrosive action of most acid and other fumes found in factories and laboratories.

R. G. Dixon and Co., Ltd.

A complete range of power-driven floor maintenance equipment, for cleaning, waxing and polishing all types of floors, and for shampooing carpets, will be shown and demonstrated. There are senior and junior models of these machines. The "Columbus" combined floor polisher, vacuum cleaner and floor scrubber, manufactured by the associate company, Rollnick and Gordon, Ltd., will also be on view.

Fleming Electrical Corp., Ltd.

The time to be saved in an office by the use of an efficient inter-communication system will be stressed at this company's exhibit, where their mains-operated "Descaphone" is to be shown. The complete equipment, which gives two-way facilities at the touch of a "speak-listen" switch, consists of a master set with four satellites, the main set being provided with a selector switch for calling individual departments or for a simultaneous broadcast to all four. The equipment is normally made for a.c. 200-250 V mains, although d.c. models are available.

General Electric Co., Ltd.

Street lighting and road signalling equipment have been chosen to represent the company's products. An "Autoflex" road signal exhibit, staged by the Siemens and General Electric Railway Signal Co., Ltd., will stress the protection given to pedestrians by "cross now" signals and pedestrian push buttons. A pneumatic road vehicle detector and contact box (normally located in the roadway) is mounted to show the operation when a vehicle passes over the detector, a simple unidirectional feature ensuring that only vehicles travelling towards the junction record their presence. An improved speed timer will also be on show, in which a normal triode has been substituted for the customary discharge tube. Among the street lighting fixtures will be the new lanterns for use with 40 and 80 W fluorescent lamps, together with other lanterns for side and main road lighting. An interesting new main road model is a die cast light-alloy sodium lantern which is a new version of the G.E.C. diffractor lantern.

The Siemens "Halton-Sieray" lantern for mercury-discharge lamps

G. A. Harvey and Co. (London), Ltd.

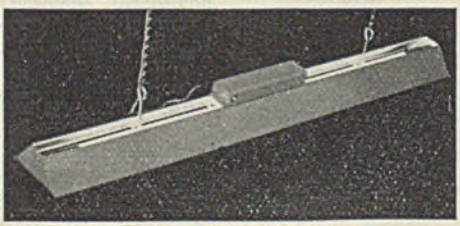
From their range of perforated metal products, the company are to show various patterns for sifting and grading coal, ash, etc., as well as special artistic grills for radiator covers and ventilators. Woven wire cloth and wire screens will also be seen, and there will be a number of metal tool cabinets, storage bins and staff lockers.

Rawlplug Co., Ltd.

Many of the fixing devices made by this company will need no introduction to readers. Special exhibits, however, will demonstrate the fixing of tram rails with "Rawlbolts," and the attachment of equipment to irregular surfaces by means of "Rawlbolts," with ferrules on studding. A new fixing device of special application when the reverse side of a wall is inaccessible is the "H" toggle, consisting of a metal member suspended on a bolt.

Scemco, Ltd.

The "Flite-Weight" fluorescent trough lighting fitting, a new product for 80 W fluorescent tubes has an open top to allow light to illuminate the area above the fitting. By the extensive use of aluminium the gross weight has been reduced by 10 lb. from the standard weight of 24 lb. A "Hi-Craft" ballast unit is placed on the top of the fitting and aluminium sleeves serve the dual purpose of covering the lamp holders and holding the lamp in position.



The "Flite-Weight" 5 ft. fluorescent fitting, by Scemco, Ltd.

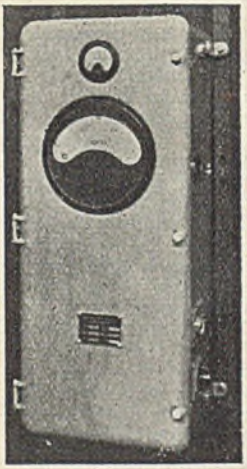
Siemens Electric Lamps & Supplies, Ltd.

Three lanterns which are to be shown for Group "A" street lighting are the "Weston-Sieray" side-entry bowl refractor lantern, designed for 250 or 400 W "Sieray" MA/V lamps, the "Dilux" lantern incorporating a new prismatic glass dish refractor recently designed by the Holophane Co., and the "Halton-Sieray," a bowl refractor type normally suitable for 250 or 400 W medium pressure mercury discharge lamps. By adding an internal refractor it is possible to use this latter model with tungsten filament lamps.

Equipment and Appliances

Electronic Voltage Regulator

In conjunction with Mr. S. Pearson, Brookhirst Switchgear, Ltd., have developed a new automatic electronic voltage regulator. The apparatus can be used for voltage regulation and stabilisation of d.c. and a.c. generators, frequency stabilisation of a.c. alternators, speed control and stabilisation of d.c. motors and Ward Leonard drives, and stabilisation of a main d.c. supply. There are, of course, several other industrial applications. The sensitivity of this regulator is claimed to be within ± 0.1 per cent. under steady load. No auxiliary supplies are required for operation, and starting and control arrangements are simple. Only one thermionic valve of standard design is employed, and this, as a result of its light loading, should have a long life. A number of these regulators are already installed, providing, in some instances, regulation to within ± 0.03 per cent.



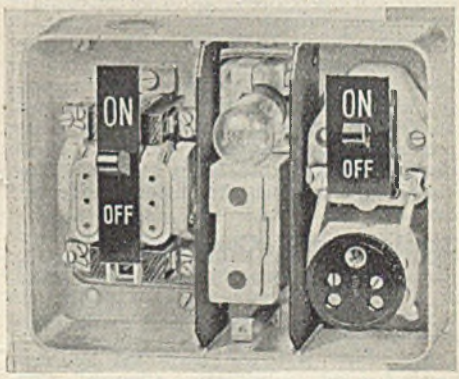
Brookhirst voltage regulator

Photographic Flash Tube

High speed flash photography is being increasingly used as a method of examining the behaviour of fast-moving objects. During the war, the Mullard Wireless Service Co., Ltd., designed a flash tube, known as the "Arditron," for the photographic examination of projectiles in flight. The company has now introduced an improved version, the type LSD. 2, which should have many useful applications in industrial research. In principle, tubes of this nature consist of a gas-filled envelope containing anode, cathode and an auxiliary triggering electrode. A capacitor is allowed to charge to high voltage, of the order of 7 500 to 10 000 V, and is then discharged through the tube by means of a subsidiary spark applied to the third electrode. With, for example, an operating potential of 7 500 V and a capacitance of 3 μF, a one micro-second flash corresponds to an instantaneous power dissipation of about 100 MW. The resulting light emission from the tube will provide effective photographic illumination over an extended area at a distance of 12 ft. for exposures at lens apertures not greater than F8. Higher tube loadings at lower voltages will give adequate illumination at distances up to 30 ft. at similar apertures. The light distribution, apart from some falling off towards the red regions, is said to be substantially uniform over the visible spectrum. In the LSD. 2 tube, which, in view of the high instantaneous loading is suitable only for single flash working, an envelope of boro-silicate glass contains a copper rod cathode, a copper rod anode and a copper ring electrode which acts as the trigger or grid, the latter requiring an oscillatory transient of about 3 000 V to start the main discharge. The anode-cathode spacing is some 30 mm., and the gas filling is mainly argon at atmospheric pressure. Potassium-activated electrodes ensure a low work function and a tube life of some thousands of flashes. Although there is an unavoidable time delay in the firing circuit and in the tube itself, this remains consistent under given conditions, and can thus be allowed for in the photographic arrangements. Photographic work, the makers point out, would normally be done in relative darkness with an open lens.

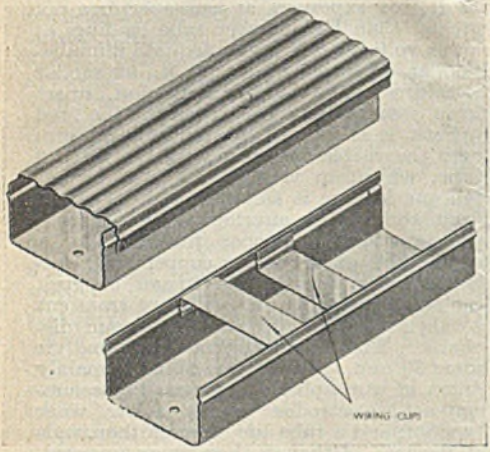
Cooker Control Unit

Close attention has been paid to outside appearance in a cooker control unit, the "Sandella," made by Wm. Sanders and Co. (Wednesbury), Ltd., of Falcon Electrical Works, Wednesbury, Staffs. It has a lightweight die-cast case of a zinc base



The "Sandella" cooker control unit with covers removed. A separate easily removed cover fits over the centre section

alloy, finished in cream enamel, and shaped with rounded corners to facilitate cleaning. Inside, the unit has two switches, for cooker and electric kettle, or other portable appliance. The cooker switch is a recently introduced Sanders d.p. toggle type, of 30 A rating and incorporating arc-damping, heat-dissipating ceramic shields over the moving contacts. The main terminals are situated at the top, with outgoing terminals at the bottom. Auxiliary terminals are provided for the subsidiary wiring. The sub-circuit is not controlled by the main switch, but consists of a 5 A socket, wired in conjunction with a 15 A s.p. toggle switch, protected by a single rewirable fuse. Both switches have mechanical indicators, the main circuit, in addition, being furnished with a pygmy lamp indicator. Access to the lamp or fuse for replacement purposes is by removing a small panel in the front of the unit, accidental contact with live parts being prevented by insulated screens which divide the unit into three sections. Two earthing terminals are fitted inside the case.



Two sections of the new channel conduit showing (top) a length with the capping sprung into position and (bottom) the wiring clips fitted in alternative positions

Steel Channel Conduits

A conduit system, designed, it is stated, as a result of many years experience in the equipment of industrial buildings, is a development of Richard Crittall and Co., Ltd., which is to be marketed by their newly-formed subsidiary, Channel Conduits, Ltd. The new "Channel Conduit" system, which is said to provide simple installations with low cost, coupled with flexibility and adaptability, consists of rectangular section conduit made in 12 ft. lengths from 16, 18 and 20 s.w.g. steel in six sizes, ranging from 1 by ½ in. to 4 by 3 in. A full range of fittings for each size, comprising tees, elbows, angles and various types of connectors, is also made. The covering and covers for the lengths of conduit and accessories are sprung on, so that the spring grip keeps the covers in position without the use of screws on nuts and bolts; removal is rapid for inspections, alterations or additions to the layout, a special tool being provided for the purpose. Where a new installation is required to meet an existing layout with metal tube conduits, a special adaptor for connecting the old and new conduits is available. Earthing arrangements are claimed to comply with I.E.E. Regulations and are incorporated in the means of connecting lengths of conduit together and the lengths of conduit to the fittings. An earth plate fitted to each connector or fitting is provided with two pointed grub screws which, when tightened down, form a strong mechanical joint and an efficient earth. The finish complies with B.S.I. Spec. 774-15 for protection of ducting and is a matt black conductor which will take paint of any colour; it is non-corrosive and is applied by a high temperature process which penetrates into the pores of the metal.

Hydro-Board Stock Isssue

THE North of Scotland Hydro-Electric Board made its first issue of stock to the public, amounting to £5 000 000 at 2½ per cent., yesterday (Thursday). Announcing the issue in a written reply last week, Mr. Dalton, Chancellor of the Exchequer, stated: "The North of Scotland Hydro-Electric Board has made good progress with its programme of development and construction, on which £2 650 000 has already been spent and commitments of £11 750 000 have been incurred. The time has now come for the Board to make its first issue of stock, in order to fund the bank advances and to cover the further capital expenditure that will mature in the near future. The Board has behind it the credit of the State, and its stock will be guaranteed by the Treasury. The issue, which will be offered to the public, will be for £5 000 000 of 2½ per cent. North of Scotland Electricity Stock, 1967-72, at par. The issue will be open to the public throughout Great Britain, but special facilities will be provided through the Scottish banks for subscriptions from Scottish investors, who will wish to take this opportunity to acquire a stake in this important contribution to the prosperity of Scotland." The Board's area of operation will be considerably increased as a result of the Electricity Bill.

Electricity Supply

St. Marylebone.—The Borough Council is to spend £8 000 on electricity meters.

Bedford.—It is recommended that because of inconvenience to consumers during the first quarter of the year, a special discount of 15 per cent. should be allowed in respect of electricity consumed during that period.

St. Helens.—Negotiations are proceeding for the erection of a new power station near the town. The Electricity Commissioners will shortly be asked to approve plans of the proposed station, which is to receive its coal supplies direct from a neighbouring colliery.

Swansea.—New ash conveyor plant at the Tir John power station will cost £13 650, and additional works necessary are estimated to cost a further £9 750. The supply and installation of the apparatus will be carried out by the John Thompson Conveyor Co., Ltd.

Darlington.—A clause in the Corporation's scheme for the hiring of electrical apparatus, giving the hirer the option to purchase, is to be deleted from future agreements. The Town Council has approved increases in electricity charges from the present 15 per cent. war increase to 33⅓ per cent.

Glasgow.—The Clyde Navigation Trust is considering a ten-year scheme for improvements at Prince's Dock, which will include the provision of cables, electric capstans and cranes, at an estimated cost of £193 550. New hydraulic pumps and electrical equipment will also be installed at the graving docks, at an estimated cost of £48 350.

Fulham.—The television set which the Borough Council proposes to sell through the electricity showrooms will now cost approximately £100 (less purchase tax) it is reported, and not between £60 and £70, as was first expected. Assuming purchase tax to be £28, the Council has fixed hire-purchase terms for the sets, production of which will shortly commence, at an initial payment of £25, and subsequently £3 per month for three years.

Egypt.—The adjudication on tenders in respect of the Aswan hydro-electric project has now been published. Swedish firms are to supply five main turbines, two main generators and main transformers at a total cost of nearly £E. 2 000 000 f.o.b. Swiss firms will supply two main and two supplementary turbines and five main and two supplementary generators at a total cost of nearly £E. 2 100 000 ex-factory. A. Reyrolle and Co., Ltd., of Hebburn-on-Tyne, are to supply switchgear to the value of £E. 732 110. Specifications for pipes and cranes have been withdrawn for later tenders.

Norway.—A 178 000 kW hydro-electric station, on which 850 workers are at present employed, is under construction at Mär, near Rjukan, Central Norway, and is expected to begin operation during autumn, 1948. A 600 ft. hall in which the generating and transformer plant are being housed is being hollowed out inside a mountain, and there will be a layer of at least 200 ft. of rock as a protective ceiling over the station which, it is claimed, will provide safety even under atomic-bomb attack. Apart from this hall, tunnels up to ten miles in length are being drilled for the water supply. Altogether, about 1 200 000 tons of rock will have to be removed. One-third of the output of the station, which is designed for an average load of 125 000 kW, is to be reserved for the industrial plant of Norsk Hydro at Rjukan, whilst the remainder will be at the disposal of the Norwegian Government for other purposes.

New Power Station Buildings.—Building and civil engineering work to the value of £75 000 000 will be carried out on electric power stations during the next two years. Site work is in operation, states the Ministry of Works, on 63 building projects to house plant capable of generating over 5 260 000 kW. Site work for 13 further projects (to provide 1 205 000 kW) will start shortly. A further programme covering the next two years is at present being drawn up. Instructions have been issued to all Ministry of Works Regional Officers to ensure a continuous supply of cement, bricks and other materials to the sites. Arrangements have been made through the Cement Makers' Federation for cement orders for these projects to have first call on deliveries, both direct and through merchants. An Interdepartmental Committee, on which are represented the Electricity Commission, Central Electricity Board and the North of Scotland Hydro-Electric Board, sits under the chairmanship of a Ministry of Works official. Its terms of reference are to speed up the supply of labour and civil engineering resources required in connection with the provision of generating capacity. Working Parties have been appointed in England and Scotland to resolve the day-to-day problems.

ANSWERS to TECHNICAL QUESTIONS

We produce below the answers to a selection of questions which have been sent to us by readers. The co-operation of students and others in making this feature one of general interest is invited

How is the tuning of an arc suppression coil carried out?

To ensure that an arc suppression coil shall completely suppress the capacitance fault current due to an earth fault on

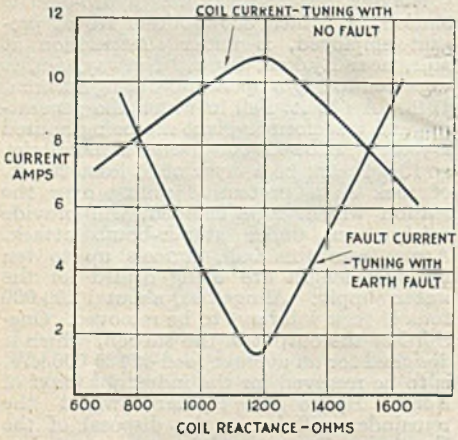


Fig. 1—Tuning curves for arc suppression coil

an isolated-neutral power system, the inductance of the coil must be of such a value as to resonate with the capacitance formed by the capacitance to neutral of the three phases in parallel, *i.e.*,

$$\omega L = \frac{1}{3\ \omega C}$$

It is difficult to calculate the capacitance accurately as it depends to some extent on weather conditions, the sag of the wires and even on the growth or otherwise of crops beneath the line. Final adjustment of the value of inductance must, therefore, usually be made on site after the coil is installed, the process being known as "tuning" the coil. Two methods are available, as it can be done with or without a fault on the system.

(*i*) *Tuning with an earth fault on one phase.*—If an earth fault is put on one phase the coil will be correctly tuned when the inductance is adjusted to make the fault current a minimum; if there were no losses in the coil or the lines, the minimum current would be zero, but this is, of course, never attained in practice and a current of 3 or 4 amperes is common on systems up to 33 kV. A curve showing the relation between fault current and coil reactance for a typical case is shown in Fig. 1.

(*ii*) *Tuning with no fault.*—If the capacitances to neutral of the three phases are not exactly equal the isolated neutral point of the system will not be at exactly earth potential, *i.e.*, there will be a potential between the neutral point and earth. This potential, which may, in practice, be as much as 5 per cent. of the normal phase voltage, is applied to a circuit consisting of the arc-suppression coil in series with the three capacitances to neutral in parallel, *i.e.*, to a series resonant circuit. In such a circuit the current is limited only by the resistance and will have a high value. Tuning, *i.e.*, adjustment to true series-resonance condition, is, therefore, carried out by adjusting the coil reactance until the current in the coil is a maximum. A typical tuning curve of this type is shown in Fig. 1. If the unbalance of the capacitances is not sufficient to produce sufficient current some artificial unbalance can be introduced, for instance by disconnecting a length of one phase of the line.

Accuracy of Tuning.—The coil is usually only adjustable in steps of 3 to 5 per cent., so the absolute accuracy is not possible. It is not, however, necessary, since on an 11 kV system a coil can be 10-20 per cent. out of tune and still be effective in suppressing faults; on higher voltage systems, however, greater accuracy is desirable.

E.O.T.

Nickel Fellowships

The Institute of Metals, the Iron and Steel Institute, the Institution of Mining and Metallurgy, the Institute of British Foundrymen and the Institution of Metallurgists, it is announced, have accepted the invitation of the Mond Nickel Co., Ltd., in awarding annually for the next fifteen years a number of fellowships to be known as the "Mond Nickel Fellowships." The company offered to make available over a number of years the sum of £50 000 for the purpose. The main object of the fellowships is to assist persons capable of appreciating and applying the results of research, rather than to encourage research itself.

ELECTRICAL UNITS

N.P.L. ANNOUNCES CHANGES TO TAKE EFFECT NEXT YEAR

IN accordance with decisions taken by the International Committee of Weights and Measures at their meeting in Paris in October, 1946, the system of electrical units employed at the National Physical Laboratory will be changed on January 1 next. The units at present in use are the "international" units based on certain material standards. From January 1, the units employed will be those derived from the centimeter, gramme and second, i.e., the so-called "absolute" units. The effects of this change may be seen from the following table:—

One	international	ohm	= 1.00049	"absolute"	ohms
One	"	volt	= 1.00034	"	volts
One	"	ampere	= 0.99985	"	ampere
One	"	watt	= 1.00019	"	watts
One	"	henry	= 1.00049	"	henries
One	"	farad	= 0.99951	"	farad

The factors given in the table apply to the mean international units; that is to say, to the mean values of the international units as realised at the various national laboratories.

After January 1 apparatus submitted to the laboratory with a view to the issue of a N.P.L. certificate of examination will be regarded as acceptable if its errors fall within the specified limits when the values are expressed in either international or absolute units, provided that it was manufactured before January 1, 1949, and is marked accordingly. Apparatus manufactured after that date and any apparatus not marked with the date of manufacture, will be acceptable only if its errors fall within the specified limits when the values are expressed in absolute units.

NEW CANDLE UNIT

Following the decision of the International Committee, the N.P.L. will also, on and after January 1, express all photometric values in terms of units based on the "new candle." This unit of luminous intensity is of such a magnitude that the brightness of a full (or cavity) radiator (black body) at the temperature of solidification of platinum is 60 new candles per sq. cm. The new lumen is the luminous flux radiated within unit solid angle by a uniform source having a luminous intensity of one new candle. The new unit of illumination will be one new lumen per unit area. One new lumen per sq. ft. will also be called one new foot-candle and one new lumen per sq. metre one new lux. The new unit of brightness will be one new candle per unit area, and, alternatively, one new foot-lambert. The latter unit is defined as the brightness of a perfectly diffusing surface of 100 per cent. reflexion factor when its illumination is one new lumen per sq. ft.

When differences of colour are involved in the determination of any magnitude in terms of these units, the evaluation will be in accordance with that which would be obtained by an observer having the relative luminosity curve (curve connecting eye sensitivity with wavelength) adopted by the International Commission on Illumination 1924 and later by the International Committee of Weights and Measures.

IMPORTANT BUT SMALL DIFFERENCES

The differences between the new units and those in use hitherto are small. The present units, based on the "international candle," were introduced on April 1, 1909, in Great Britain, France and the U.S.A., and were adopted in 1921 by the International Commission on Illumination. Nevertheless, Germany and some Central European countries continued to use units based on the Hefner candle (about 0.9 international candle). The international candle was not based on any primary standard; it was derived from the units defined in terms of the old flame standards and was maintained by means of carbon and tungsten filament electric lamps. Further, the values of the unit at different colour temperatures did not exactly agree, when compared on the basis of the international relative luminosity curve adopted in 1924.

The magnitude of the new unit has been so chosen that it will introduce only very small changes (less than 0.5 per cent.) in the values of luminous intensity assigned to lamps operating at a colour temperature of about 2 360°K. For lamps at considerably higher colour temperatures, e.g., ordinary gas-filled electric lamps at normal efficiencies, the values expressed in terms of the new candle will be several per cent. lower than those expressed in international candles. At the colour temperature of the primary standard (2 046°K), values in terms of the new candle are about 1.7 per cent. higher than those in terms of the international candle.

On account of this alteration in the basis of which sources of light of different colours are compared, it is impossible to give a factor for converting values in international candles to value in new candles.

Industrial Information

Annual Outing

Metway Electrical Industries Ltd., announce that their offices and works will be closed on July 19 for the annual staff outing. This will take the form of a motor trip to Windsor for lunch, and then by boat to Hampton Court.

Lamp Contracts

The L.N.E.R., King's Cross, has placed a contract for Cosmos and Metrovick electric lamps for a further period of twelve months, ending April 30, 1948, with the Metropolitan-Vickers Electrical Co., Ltd.

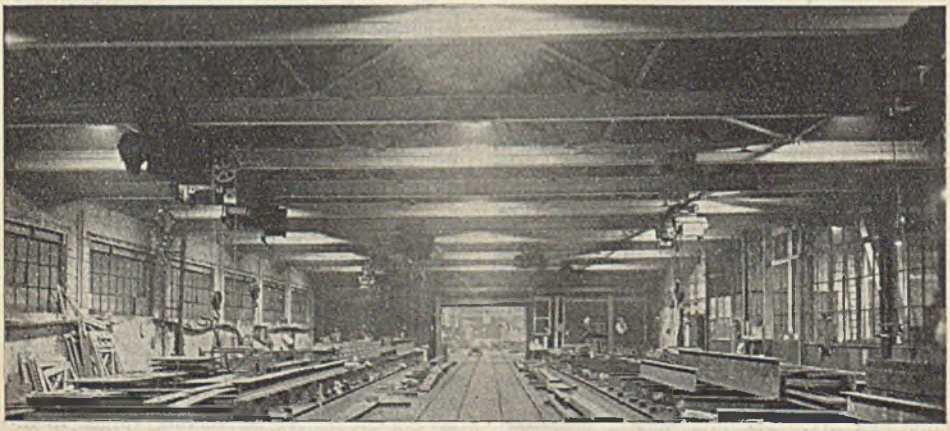
Thorn Electrical Industries Ltd. announce that their tender for the supply of Atlas lamps until March 31, 1948, has been accepted by the Metropolitan Borough of Islington.

Courses in Illuminating Engineering

Two courses in illuminating engineering have been arranged to take place in London during the period September, 1947, to May, 1948, one at the Northampton Polytechnic on Wednesday afternoons and evenings, the other at the Borough Polytechnic on Thursday afternoons and evenings. The courses will prepare candidates for the City and Guilds of London Institute intermediate examination in illuminating engineering, passing of which is one of the essential qualifications for those desiring to be placed on the I.E.S. Register of Lighting Engineers. Those wishing to enter their names for either of these courses should communicate with the polytechnic concerned. A course has also been arranged at the Central Technical College, Birmingham to commence in September this year and other courses are in prospect at Cardiff, Leeds, Liverpool and Manchester; further details are available from the Illuminating Engineering Society, 32, Victoria Street, London, S.W.1.

Steel Works Lighting

While preparations were going on for D-day, the Metropolitan-Vickers Electrical Co., Ltd., undertook the re-lighting of the works of Redpath, Brown and Company Ltd. To-day when the need for steel sections for building reconstruction is as urgent as was that for war material, the installation is enabling the same efficient output to be maintained. 400 W and 250 W mercury discharge lamps are used throughout for general lighting, and special Metrovick type SFT low voltage safety units are used on the batteries of drills. These units comprise 400/440 V 50 V 45 VA transformers with low voltage lighting 3-arm fittings, housing 40 W lamps screwed on the arms of the drills. Specially balanced cable arrangements are made for the bracket arm to be swung round with the drill head. In two of the drilling bays 80-400 W mercury discharge lamps mounted at a height of 33 ft. give a general illumination of 7/8 lumens per foot^2 over the working area. In the fitters' shop 250 W mercury discharge lamps in skirted dispersive reflectors, mounted 16 ft. 6 ins. are arranged to give complete cut-off to enable the operatives to see clearly the marking on the steel plates for drilling and other purposes. The illumination in this



Metrovick lighting in the platers' shed at the works of Redpath Brown & Co., Ltd.

shop is 8/10 lumens per foot² on the working plane. For the fittings shop, electricians' and joiners' shops 250 W discharge lamps are used in skirted dispersive reflectors, mounted 16 ft. 6 ins. above the working plane, providing 11/12 lumens per foot². The wiring was carried out by S. Dickinson Ltd., Fountain Street, Manchester.

Herts. Agricultural Show

The Hertfordshire Show is being held this year at North Mymms Park on July 24, and the Northmet Company has arranged a comprehensive exhibit of electrical appliances for the farm, the market garden and the home. Manufacturers supporting the exhibit will include:—

Fredk. A. Pullen & Co., L. F. King, Nazeing, Keith Blackman, Ltd., Electrocult, Ltd., Rheostatic Co., Ltd., General Electric Co., Ltd., Clifford & Snell, Ltd., Chase Protected Cultivation, Ltd., Tarpen Engineering Co., Ltd., Geo. Monro, Ltd., Heatrae, Ltd., W. L. Holland, Ltd., Christy & Norris, Ltd., Lipton Products, Ltd., Byron Farm Machinery, Ltd., Herbert Morris, Ltd., Loading Devices, Ltd., Ferranti, Ltd., Geo. W. King, Ltd., Curfew Appliances, Ltd., Mc. and B. Heat Control, Ltd., Cope and Cope, Ltd., Brecknell, Munro & Rogers, Ltd., John Steel, Broadwall Engineering Co., Ltd., Pulsometer Engineering Co., Ltd., Thomas & Son (Worcester), Ltd., Pressed Steel Co., Ltd., Gascoignes (Reading), Ltd., J. W. Woolley & Co., Ltd., Cocks & Sons, Tomlinson (Electric Vehicles), Ltd., S. Wolf & Co., Ltd., Eutalloy, & Welding Processes, Ltd., Banner Electric Co., Ltd. Stenor, Ltd., Marconi Instruments, Ltd., Alldays & Onions, Ltd., Belling & Co., Ltd., English Electric Co., Ltd., Jackson Electric Stove Co., Ltd., Moffat, Ltd., Revo Electric Co., Ltd., Aidas Electric, Ltd., Simplex Electric Co., Ltd., Universal Boilers & Eng. Co., Ltd., Wilkins & Mitchell, Hotpoint Electric Appliance Co., Ltd., Hurley Machine Co. (Eng.), Ltd., Electrolux, Ltd., Frigidaire, Ltd., Hoover, Ltd., Morphy Richards, Ltd.

"Civils" Conversazione

At the first post-war conversazione of the Institution of Civil Engineers, held at the Institution building in Great George Street, Westminster, on Thursday evening, July 10, there was shown a small but varied exhibition of scientific and general engineering interest. A water model demonstrated the principles on which the ventilating system of the new House of Commons debating chamber is being designed, and another showed how, by electro-chemical action, appreciable hardening could be produced in London clay when aluminium anodes are used to pass a current through the soil. A radio link was shown, with which, using a modulated carrier, the strain on a structure could be measured at some remote point where it was difficult to set up apparatus, and a working model built by the Road Research Laboratory demonstrated how, by means of electro-osmotic action, the construction of foundations in river silts could be facilitated by causing a water movement with an electric current. Among the many distinguished guests present at the conversazione, who were received by the President, Sir William Halcrow, were the President of the I.E.E., Mr. V. Z. de Ferranti, Sir Henry Dale, Sir Charles Darwin, Sir Henry Self, and Prof. R. V. Southwell.

Domestic Appliances for Hospitals

The "Hospitals Domestic Aids" Exhibition, opened by the Minister of Health at the Empire Tea Bureau, Regent Street, on Monday afternoon, has been organised by the Electrical Development Association in conjunction with the British Gas Council in order to demonstrate to hospital authorities the benefits which modern appliances can provide. The electrical exhibits, of which there are more than 70, range from the more usual small household accessories, such as percolators and toasters, to large dish-washing machines, automatic bread-slicers, floor scrubbers and electrically heated food trolleys. Ovens for hospital kitchens and other equipment required for the cooking of meals for patients and staff are not displayed, for reasons of space, but the selection which has been made provides a clear impression of the advantages arising from the use of modern automatic equipment in many aspects of hospital domestic routine. The exhibition will remain open until August 2.

The manufacturers who have contributed exhibits to the electrical section are:

Ajax Domestic Appliance Co., Ltd.; Aidas Electric, Ltd.; G. F. E. Bartlett and Son, Ltd.; Belling and Co., Ltd.; Bendix Home Appliances, Ltd.; Berkel and Parnall Co., Ltd.; British Vacuum Cleaner and Engineering Co., Ltd.; Burco, Ltd.; Campbell Engineering Co., Ltd.; E. K. Cole, Ltd.; John Compton Organ Co., Ltd.; Crypto, Ltd.; Dowsing Co. (Electrical Manufacturers), Ltd.; R. G. Dixon and Co., Ltd.; Electrolux, Ltd.; Frigidaire, Ltd.; Gardiner and Gulland, Ltd.; General Electric Co., Ltd.; J. Glover and Sons, Ltd.; Gramophone Co., Ltd.; Hague and McKenzie, Ltd.; L. G. Hawkins and Co., Ltd.; Hobart Manufacturing Co., Ltd.; Hoover, Ltd.; Hotpoint Electrical Appliance Co., Ltd.; Jackson Electric Stove Co., Ltd.; Jones Sewing Machine Co., Ltd.; Lightfoot Refrigeration Co., Ltd.; Mabbott and Co., Ltd.; Metcalf Ideal Products, Ltd.; Morphy Richards, Ltd.; Premier Electric Heaters, Ltd.; Rediffusion, Ltd.; S.L.R. Electric, Ltd.; Simplex Electric Co., Ltd.; Steel and Co., Ltd.; Sterling Engineering Co., Ltd.; Jas. Stott and Co. (Engineers), Ltd.; B. and P. Swift, Ltd.; Vent-Axia, Ltd.

Marconi Jubilee Brochure

To commemorate the fiftieth year of the establishment of the company, Marconi's Wireless Telegraph Co. have prepared a handsome and attractively illustrated brochure which reviews the history of the company to the present day. It describes the scientific background—Clerk Maxwell's prediction of electro-magnetic waves in 1867 and Hertz's experimental proof of their existence—which led Guglielmo Marconi

working at his home in Bologna, to begin experiments. In 1895, he succeeded not only in getting waves to travel across space, but in employing successions of waves broken into groups to convey intelligible messages. The book makes it clear that the fact that nearly all the important early experimental wireless work was undertaken in this country must be credited to the inventor's mother, of Scottish and Irish ancestry, who herself made arrangements for Marconi to meet Sir William Preece, then Chief Engineer of the G.P.O. Photographs of some of the original aparatus and early broadcasting stations help to give a remarkably interesting survey of the growth of an industry which, in only 50 years, has progressed from very modest beginnings to radar, television and the remote control of aircraft.

Electrical Machinery Traders

New members elected by the Committee of the Association of Electrical Machinery Traders are the British Electric Co., A. Cooksley and Co., Ltd., J. E. Fowler, and Hackett and Son.

Annual Holidays

Clayton, Lewis and Miller, Ltd., announce that their factory will be closed for the summer holiday from July 25 to August 5.

The Phœnix Telephone & Electric Works Ltd. announce that their works and offices will be closed for the annual holiday from 5.30 p.m., Friday, July 25, until 8 a.m., Tuesday, August 5. Goods cannot be accepted or despatched during the period.

The summer holiday break will operate among the various establishments forming the Philips Group during the undermentioned periods: Mitcham Works, July 28 to August 5; Blackburn Works, July 19 to 26; Hamilton Works, Lanarkshire, radio transmission equipment, Balham, and Philips Industrial, Brixton, July 19 to 26. The service department and stores at Waddon, Surrey, will not close.

Tensor Analysis

One of the newest of the mathematical approaches now available to the engineer for the predetermination of performance of machines and structures is that known as tensor analysis. Johnson and Phillips, Ltd., announce the issue of a brochure, publication TF 14, entitled "The Direct Setting-up of $Z_{\alpha\beta}$ for Closed-Mesh Networks from the Network Diagram," which shows the application of tensor methods to the study of static network impedances considered, from a specified reference frame. A companion brochure (TF 15) will be issued later in the year on the Direct Setting-up of $Y^{\alpha\beta}$ for Junction Networks. A small supply is still available of publication TF 13, "The Impedances of Multiple-Winding Transformers," in which tensor methods are employed in the study of the self and mutual impedances of transformers. The brochures are reprints of articles by the company's technical advisor, Mr. S. Austen Stigant, which appeared originally in the B.E.A.M.A. Journal. Applications for copies, which will be provided free of charge, should be made to the company at Victoria Way, Charlton, London, S.E.7.

Contract Price Adjustment Formulæ

The B.E.A.M.A. announce that for purposes of calculating variations in: (a) "Rates of Pay"—the rate of pay for adult male labour at July 12, 1947, shall be deemed to be 110s.; (b) "Costs of Material"—the index figure for Intermediate products last published by the Board of Trade on July 12 is 221.4 and is the figure for the month of June, 1947.

E.I.B.A. Report

THE annual report of the council of the Electrical Industries Benevolent Association, prepared by the secretary, Mr. H. Senior Fothergill, for presentation at the annual general meeting on July 24, stresses the value of the personal element introduced by the association into its charitable work, which, it considers, may often have more far-reaching results than the giving of a money grant alone. Many letters expressing appreciation are quoted in support.

During the year the number of cases dealt with was 253 (an increase of 25 per cent. on 1945), a figure which, taking into account families and other dependents, resulted in 465 men, women and children being assisted, of whom 142 were widows. Of this number, 85 cases involving 192 people were newly reported during the year, whereas the new cases in 1945 numbered 66. All but five of the 253 cases dealt with involved money payments on the part of the association, and the amount paid out in grants, pensions and allowances amounted to £16 134, a record figure in E.I.B.A. history and an increase of £3 983 on 1945.

This expansion in the association's work is ascribed partly to the growing awareness of the benefits available to people in distress in the industry, and partly to "the alarming number of men who are breaking down with arthritis and other nervous complaints, and of men and women who are being overcome with tuberculosis," a legacy, it is thought, of the war period. A contributory factor was the large number of people on fixed income who, the report states, are in real poverty as a result of increased living costs.

Contracts Open

WE give below the latest information regarding contracts for which tenders are invited. In the case of overseas contracts, particulars are to be had from the Board of Trade, Millbank, London, S.W.1 (corner Horseferry Road), unless otherwise stated:—

Dundee, July 21.—Supply, delivery and erection of automatic CO_2 fire extinguishing equipment for 33 kV sub-station at Clepington. Specification from Town Clerk, City Chambers, Dundee.

Bridgnorth, July 26.—Electrical installation in 18 houses at Sydney Cottage site. Specification from Town Clerk, College House, Bridgnorth.

Hornsey, July 28.—Provision of all labour and materials for electrical installation in 116 flats at North Hill, Highgate. Specification from Chief Electrical Engineer and Manager, Electricity Showrooms, Crouch End, N.8.

Accrington, July 31.—Tenders invited for purchase of: 2 000 kW B.T-H. Curtis turbo-alternator, three-phase, 50 cycles, 6.6 kV, 3 000 r.p.m., with Cole Marchant condensing plant. Further particulars from Borough Electrical Engineer, Corporation Electricity Works, Hyndburn Road, Accrington.

Hazel Grove (Cheshire), July 31.—Supply and delivery to Hazel Grove and Bramhall U.D.C. of two 750 kVA transformers with externally operated off-load tap changing gear. Specification from Chief Electrical Engineer and Manager, Electricity Offices, Chapel Street, Hazel Grove, Cheshire; deposit, £1 1s.

Newport, July 31.—Manufacture, supply and installation of 3 kV main and pilot cables, by companies fully experienced in laying of submarine cables. Specifications from Electrical Engineer and Manager, Electric House, Dock Street, Newport, Mon.; deposit, £1 1s.

Dundee, August 13.—Supply of multicore h.v. and l.v. p.i. cables. Particulars from City Electrical Engineer, Corporation Electricity Department, Dudhope Crescent Road, Dundee.

Halifax, August 18.—Manufacture, delivery, laying and jointing of 33 kV underground cables and manufacture, delivery and erection of 33 kV metal-clad switchgear and control panels, etc. Specifications from Borough Electrical Engineer and Manager, 19/23, Northgate, Halifax; deposit, £1 1s.

Reigate, August 22.—Supply of: (a) six units, each comprising three oil-immersed, 11 kV, 300 A switches and six eight-way isolator and fuse units; (b) six 500 kVA, three-phase, 50 cycles, oil-immersed transformers. Specifications from Engineer and Manager, Electric House, Linkfield Corner, Redhill, Surrey.

In Parliament

Load Shedding.—It was intimated by the Parliamentary Secretary to the Ministry of Fuel and Power that a statement indicating the progress made in dealing with the problem of load-shedding would be made very shortly, probably in the course of next week.

National Hearing Aids.—Replying to Sir E. Graham-Little, Mr. Herbert Morrison said that information about the new national hearing aid, including particulars of performance tests carried out by the National Physical Laboratory, would be given in the report of the Electro-Acoustic Committee of the Medical Research Council. This was now in the Press and would be issued by H.M. Stationery Office in due course.

Toasters and Shavers.—Mr. Shawcross asked the Minister of Supply whether he would take steps to secure the manufacture of automatic electric toasters and razors in the United Kingdom, or allow their importation from the U.S.A. or Switzerland. Mr. Wilmot answered that as these articles could not be regarded as an urgent need, any substantial importation from hard currency sources was out of the question at the present time. Since they would, however, be much in demand in the future, a number of licences to manufacture had been issued, and they were pressing manufacturers to develop their production, mainly at present for the purposes of export.

Electrical Steel.—The Minister of Supply was asked by Mr. Skinnard whether, in view of the difficulty experienced by small industrial units in obtaining a fair proportion of the available supplies of electrical sheet steel used in the manufacture of telecommunications equipment for export, he would apply controls similar to those imposed on the distribution of mild steel sheet. Mr. Wilmot replied that arrangements for the distribution of electrical sheet were at present being reviewed. While the present shortage continued, priority must be given to programmes directly contributing to the expansion of fuel and power resources, and supplies to other users had, therefore, to be restricted.

Company News

HICK, HARGREAVES AND CO., LTD.—Net prft. for year ended March 31, £52 741, and not £53 464 as previously announced.

TELEGRAPH CONSTRUCTION AND MAINTENANCE CO., LTD.—Int. div. of 5% actual (1s. per share) less inc.-tax, has been declared for yr. endg. December 31, 1946.

STREAM-LINE FILTERS, LTD.—Net trdg. prft. for yr. endg. December 31, 1946, £39 269 (£52 385). To dirs.' fees £1 050 (£878), depreen. £1 440 (£866), taxn. £20 000 (£35 831), prft. subj. to dirs.' addtl. remuneration £16 779 (£10 430). To gen. res. £4 000 (same), int. div. 5% less tax, £2 750, and prpsd. fin. div. 10% less tax, £5 500, mkg. £8 250 (£7 000); fwd. £18 988 (£15 471). Current liabs. £141 829 (£110 504) and current assets £212 067 (£273 912).

ORIENTAL TELEPHONE AND ELECTRIC CO., LTD.—The report states that owing to delay in receipt of audited returns from Singapore it will not be possible to complete accounts for 1946 in time for submission to the meeting on July 29. The Chairman will move that the meeting be adjourned. It is proposed to convert the issued ordinary shares into £1 units and also to amend articles.

BRITISH TIMKEN, LTD.—Consolidated trdg. prfts. for yr. 1946, £329 164 (£207 697). Depreen. absorbs £115 288 (£29 817), incl. £65 270 of special nature. Alloen. for taxn. £102 278 (£87 235), and div. of parent coy. maintained at 15%; after placing £30 000 (£31 519) to gen. res., carry-fwd. £151 788 (£117 458). Current assets £1 559 753 and current liabs. and provns. £1 025 841. At annual meeting to be held on July 21, a resolution will be put to increase the limit upon borrowing powers of directors to £600 000.

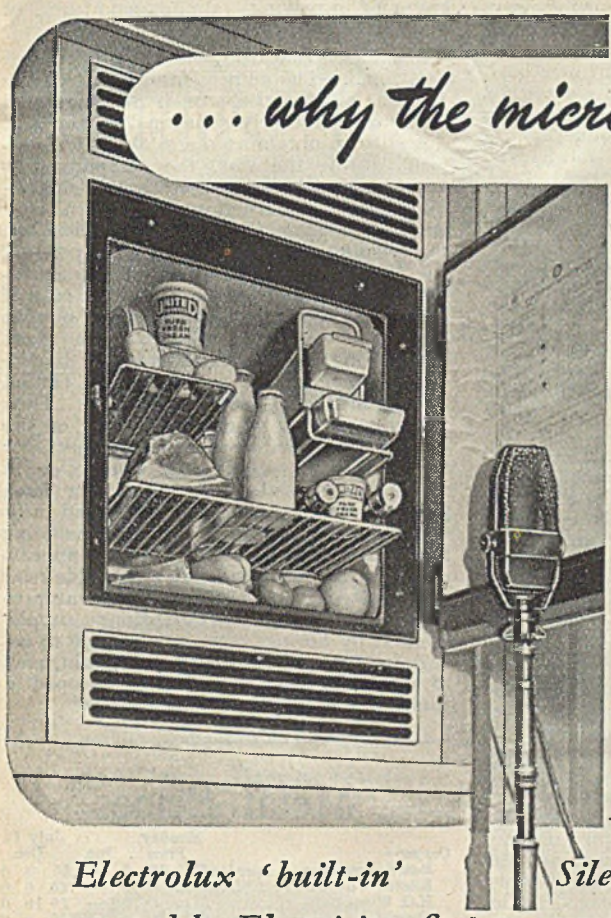
GARRARD ENGINEERING AND MANUFACTURING CO., LTD.—Speaking at the annual meeting, Mr. H. V. Slade (chairman) said the year under review had proved a very difficult one. The company now had a programme in hand and facilities available to meet the requirements of both the home and export trade, and the present order book was the largest in the company's history, but shortages of materials prevented them from meeting demands. New products had received close attention, the Chairman said, but because of the heavy demand for their standard products and the difficulty in obtaining materials, these had been held in abeyance for the time being.

CAWNPORE ELECTRIC SUPPLY CORP., LTD.—A recent adjudicator's award in respect of a strike of employees for higher wages would, if enforced, result in employees receiving 50 per cent. of the value of all the Corporation's reserve funds, declared the chairman, Mr. K. A. Scott-Moncrieff, at a shareholders' meeting in London. He stated that the company had not been able to agree to claims put forward by the workers and the Government had then appointed an adjudicator. A few days ago an award, which was confirmed by the Government, was declared. Legal opinion on the award was being sought, and the board intended to take all possible steps for its revocation.

ISLE OF THANET ELECTRIC SUPPLY CO., LTD.—Delay in obtaining a rating assessment is held responsible for the late presentation of the company's accounts for the year ending December 31, 1946, states a circular to stockholders. It is explained that the rating authorities appealed for a revision in respect of the period April 1 to December 31, 1946, of the rating assessment on the electricity undertaking previously owned by the company, and despite urgent requests from the company and the local authorities for the matter to be dealt with promptly, very little progress has apparently been made. The company is now advised that a draft revised rating valuation may be available for consideration in August next. Until the new assessment is agreed, the accounts for the year cannot be completed, neither can the purchase price payable by the Margate, Broadstairs and District Electricity Board be ascertained. The directors state that the rating question is the only matter outstanding, and give financial results for the year subject to adjustment (if any) of local rates. These show that revenue for the year totalled £173 052 (as against £108 635 for 1945), less expenses £100 490 (£57 566), leaving a surplus of £72 562 (£51 069). After deducting allocations to sinking funds, debenture stock interest and interest on sinking funds, totalling £23 272 (£23 057) and adding interest received £554 (£917), profit for the year, subject to rates adjustment, is £49 844 (£28 929).

SOUTHERN AREAS ELECTRIC CORP., LTD.—The chairman, Viscount Elibank, presided at the recent annual meeting. In the course of his speech, which dealt largely with the position of the company under the Electricity Bill, he said that their policy had been to develop their manufacturing subsidiaries in view of the threatened severance of the electricity supply interests. In Mawdsley's, Ltd., of Dursley, they had an efficient electrical manufacturing works, and Gillott Electro-Steam Cookers, Ltd., was also being developed, although shortage of materials and the national fuel

. . . why the microphone?



. . . just to emphasize that Electrolux Refrigeration is *Silent*. Even the most sensitive microphone cannot pick up a sound from an Electrolux Refrigerator which is *always Silent*.

Why is this so? Simply because Electrolux Refrigeration functions without machinery, without moving parts. This means other things too: freedom from vibration and radio interference, low maintenance cost, absence of wear and tear, dependability.

Incidentally, here you can see for yourself how much perishable food the 1½ cub. ft. Electrolux can take. Nothing is left out that matters.

And for larger homes there will be larger Electrolux Refrigerators of this type as well as free standing models.

Electrolux 'built-in' Silent Refrigerators, operated by Electricity, fit into any kitchen plan and can be built into modern kitchen furniture at any height.

Electrolux

Silent

REFRIGERATION

By Appointment Refrigerator Makers

By Appointment Suction Cleaner and Refrigerator Manufacturers

by ELECTROLUX LTD · LUTON · BEDS. Head Office: 153/5 REGENT ST. · W.1

Also Manufacturers of the famous Electrolux *Quiet* Suction Cleaners

economy campaign were proving to be retarding factors. A third subsidiary, P.A.M., Ltd., had been engaged until the end of the war solely on contracts for the Admiralty, but efforts to obtain new business were bearing fruit, and there seemed every prospect of the works being fully occupied shortly on the production of various types of precision mechanical equipments. New Day Electrics, Ltd., another subsidiary, was in the early stages of developing prototypes of electrical accessories for which, in time, there should be an increasing demand. They had also formed a new company, under the name of Mono-Cam, Ltd., for the sale and servicing of a new type of pump. Other projects had been under consideration, the Chairman said, but action had been deferred until they could see more clearly the effect of the passing of the Electricity Bill.

BROADCAST RELAY SERVICE, LTD.—Speaking at the annual general meeting, the new Chairman (Mr. J. S. Wills) said that shareholders would doubtless be aware of his connection with the British Electric Traction Co., Ltd., which had recently increased its holding in their company. They had not, however, secured control, and he wished to make it clear that Broadcast Relay had not become a subsidiary of any other company or group. It retained its independence, and would continue to be developed solely on its own merits. After saying that many thousands of new subscribers had recently been connected to their Rediffusion networks, Mr. Wills stated that, although he was confident that the company's licenses would be extended beyond the present expiry date of December 31, 1949, no decision on the matter had yet been reached. The factory at Wandsworth was busily engaged in developing a valuable export market for radio-heating and communication equipment. In their overseas business, they were entering upon a period of rapid expansion, and their first broadcast station overseas—Radio Trinidad—would be operating within a few weeks. The Chairman ended his speech by listing some of the technical advantages which, he said, were enjoyed by subscribers to the company's relay services.

LISBON ELECTRIC TRAMWAYS, LTD.—In his statement to shareholders, Sir Alexander Roger (chairman) spoke of shortages of materials, and said that delays in delivery of supplies, some of which were ordered in 1945, had prevented improvement and expansion of the Lisbon transport services on the scale planned. The continuing increase in the general travelling public was producing a traffic congestion problem in Lisbon which was very perplexing, and the company had, meanwhile, presented to the authorities a five-year expansion programme involving an expenditure of approximately £1 000 000.

BRAZILIAN TRACTION, LIGHT AND POWER CO., LTD.—The President (Mr. Henry Borden) said at the annual meeting, held in Toronto recently, that as a result of difficulty in obtaining materials and equipment during the war, the company was now faced with the necessity of undertaking new construction work on a very large scale. More than 100 000 applications for telephones could not be met pending the receipt and installation of the necessary equipment, and the estimated cost of the expansion programme over the next few years was $160 000 000. To assist in carrying out an extensive new hydro-electric programme, a well-known United States firm had been engaged. They would undertake the greater part of the Paraiba-Pirai water diversion project for the Rio power supply, the completion of which was scheduled for 1950. At the Serra plant, a new 91 000 H.P. unit had now come into service. Some concern was being felt, the President revealed, at the appearance of fissures or cracks in the hillside near the penstocks which carried the water to Serra. Geological investigations supplemented by borings were being made to ascertain the exact nature of the terrain, part of an old landslide which had developed in times past and then come to rest.

Metal Prices

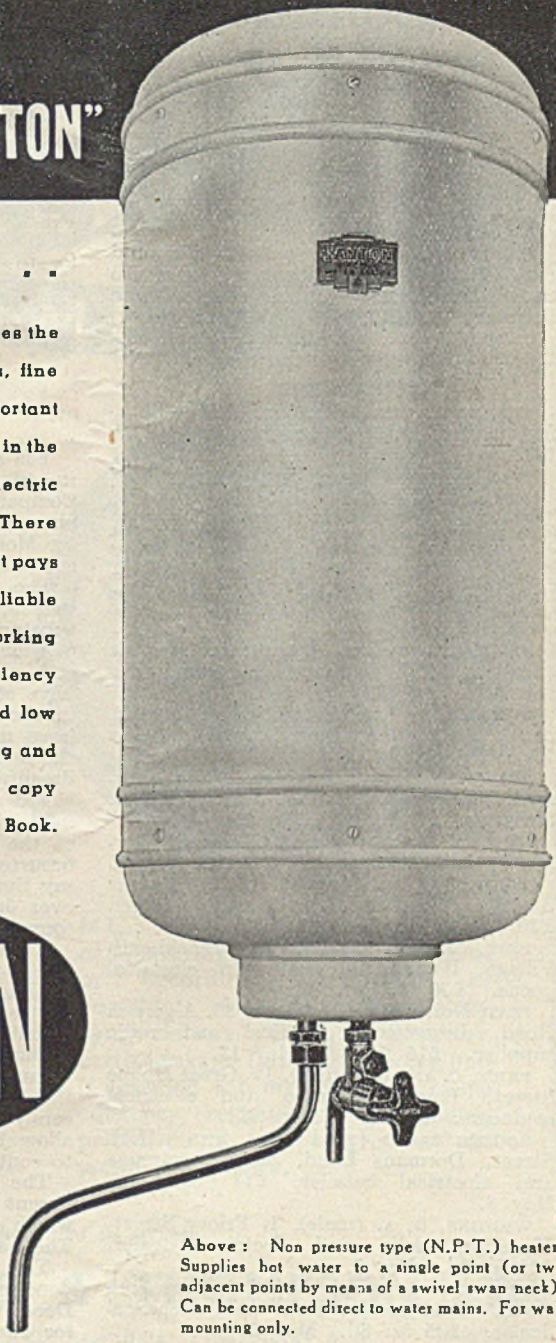
		Monday, Price	Inc.	July 14 Dec.
Copper—				
Best Selected (nom.)	per ton	£130 10 0	—	£5 0 0
Electro Wire bars	„	£132 0 0	—	£5 0 0
H.C. Wires, basis	„	£149 0 0	—	£5 10 0
Sheet	„	£173 10 0	—	£5 0 0
Bronze Electrical quality 1% *Tin*—				
Wire (Telephone) basis	per ton	£172 5 0	—	£5 10 0
Brass (60/40)—				
Rod basis	per lb.	1s. 2d.	—	¼d
Wire	„	1s. 6¼d.	—	¼d
Iron and Steel—				
Pig Iron (E. Coast Hematite No. 1)	per ton	£8 19 0	—	—
Galvanised Steel Wire (Cable Armouring) basis 0.104 in.	„	£34 5 0	—	—
Mild Steel Tape (Cable Armouring) basis 0.04 in.	„	£21 15 0	—	—
Lead Pig—				
English	„	£91 10 0	—	—
Foreign and Colonial	„	£90 0 0	—	—
Tin—				
Ingot (minimum of 99.8% purity)	„	£442 10 0	—	—
Wire, basis	per lb.	5s. 6¾d.	—	—
Aluminium Ingots	per ton	£80 0 0	—	—
Spelter		£70 0 0	—	—
Mercury (spot)	per bott.	£17 3 6	—	—

Prices of galvanised steel wire and steel tape supplied by C.M.A. Other metal prices supplied by B.I. Callender's Cables, Ltd. The latter prices are nominal only, and do not include any allowances for tariff charges.

Why it pays to specify "SANTON"

(4) Santon Quality . .

SANTON quality comprises the main factors—good materials, fine workmanship and, most important of all, thirty years experience in the design and manufacture of electric water heaters of all types. There are many other reasons why it pays to specify SANTON. More reliable elements ensure longer working life, increased thermal efficiency cuts down electricity bills and low watt density minimises scaling and maintenance. Write for your copy of the new SANTON Data Book.



NEWPORT SANTON MON (ENG)

ELECTRIC WATER HEATER

TRADE MARK "SANTON"
9934 F

Above: Non pressure type (N.P.T.) heater. Supplies hot water to a single point (or two adjacent points by means of a swivel swan neck). Can be connected direct to water mains. For wall mounting only.

Visit our stand F.2 at "Industrial Wales" Exhibition.

Commercial Information

Mortgages and Charges

NOTE.—*The Companies Act of* 1908 *provides that every mortgage or charge shall be registered within* 21 *days after its creation, and that every company shall, in its annual summary, specify the total amount of debt due from it in respect of mortgages or charges. The following mortgages and charges have been registered. The total debt prior to the present creation, as shown in the annual summary, is given—marked with an *—followed by the date of the summary, but such total may have been reduced.*

CHADDERTON RADIO AND TELEVISION CO., LTD.—June 9, £530 debenture, to H. H. Speight, Rochdale, general charge. *Nil. February 14, 1947.

TEMCO, LTD., Lydbrook.—June 10, £20 000 debentures; general charge.

Satisfaction

VENT-AXIA, LTD., London, S.W.—Satisfaction June 11, £4 000, registered April 29, 1938.

County Court Judgments

NOTE.—*The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be actions. But the Registry makes no distinction. Judgments are not returned to the Registry if satisfied in the Court books within* 21 *days.*

J. J. RADIO AND ELECTRICAL SERVICE (firm), Old Hill, Falmouth, radio and electrical dealers. £12 2s. 11d. May 6.

BUXTON, H. (male), 86, High Street, South Normanton, Derby, radio dealer. 18s. 10d. April 21.

BRUNWIN, Grant, Ness Road, Shoeburyness, Essex, radio retailer, trading as G.B. Services. £10 8s. 5d. May 9.

MODERN RADIO (firm), Thorpe Bay, Essex, radio dealers. £17 5s. 11d. May 8.

JONES, C. A. (male), 362, Tunnel Avenue, London, S.E.10, radio dealer. £29 11s. May 1.

PEAT, M. F. (male), 28, Blackheath Village, Blackheath, dealer in electrical goods. £56 8s. 11d. May 7.

PEAT, Norman F., Top Flat, 86, Algernon Road, Lewisham, electrical and radio supplier. £15 2s. 8d. May 13.

PRICE, C. AND CO. (firm), 12, Great Holme Street, Leicester, radio and electrical engineers. £14 13s. April 29.

ROGERS RADIO (sued as a firm), High Street, Dormans Land, Surrey, wireless and electrical retailer. £14 8s. 11d. May 8.

WIGGINS, G. A. (male), 1, Priory Street, Hastings, radio and electrical dealer. £19 5s. 9d. May 5.

ASQUITH, — (male), 7 and 8, Foreshore Road, Scarborough, radio and electrical dealer. £25 5s. 8d. May 2.

LOTHIAN, T. (male), 45, Cold Bath Road, Harrogate, radio dealer. £16 12s. 7d. May 8.

BRAY'S RADIO SERVICE (sued as a firm), 20, Stockton Street, West Hartlepool, electrical dealers. £22 0s. 5d. April 23.

TAYLOR, J. H. (male) 29, Watson Road, Clacton-on-Sea, Essex, electrical engineer. £20 14s. 10d. April 22.

TAYLOR, J. H. (male), 29, Watson Road, Clacton-on-Sea, Essex, radio dealer. £19 9s. 11d. April 24.

Company Meeting

W. T. Henley's Telegraph Works

Increase in Turnover

The sixty-eighth ordinary general meeting of W. T. Henley's Telegraph Works Company, Limited, was held at the Dorchester Hotel, London, W.1, on July 11, Sir Montague Hughman (chairman of the company) presiding.

The Chairman, in the course of his speech, said: I am pleased to report a substantial increase in our turnover, some of which is accounted for by the rise in the cost of materials, but undoubtedly, we have seen signs of recovery, as the figures in the balance sheet indicate. Still, we have many problems to face to-day, and the setback which we received during those dreadful winter weeks when we were closed down for want of fuel, power and light will ever stand in my memory as one of the most disastrous and unpleasant occurrences in my lifetime. I am glad to say that our exports overseas amounted to over 36 per cent. of our total business, compared with 27 per cent. in 1945.

At home we have to face the fact that the electric supply industry is about to be nationalised, and we are, by the nature of our business, very much interested in the distribution side of the industry. This change may have far-reaching effects, as we may have one authority the buyer for the bulk of our home production. I sincerely trust that this new authority will allow the cable manufacturing companies to continue the fine work they are doing.

The balance on trading account of the parent company amounts to £633 482, which is £50 653 greater than last year. The balance brought forward is £393 219.

The directors recommend a final dividend of 10 per cent. for the year ended December 31, 1946, making 15 per cent. for the year. They also recommend a cash bonus of 5 per cent., leaving to be carried forward £413 822.

The report was adopted.

NALDERS

N C S

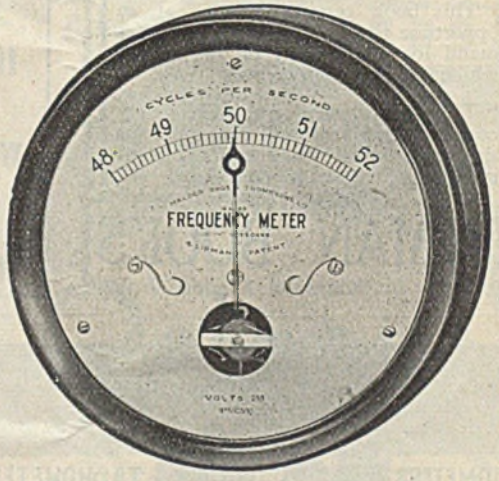
FREQUENCY METERS

PRECISION TYPE

N.C.S. Frequency Meters of Precision Type comply with B.S.S. No. 89—1937 for short-range precision accuracy, being within 0.1% of the mean value of the frequencies shown on the scale.

The instruments are independent of voltage and temperature variations over wide limits and develop no self-heating errors. Low v.a. consumption.

Supplied with 90, 150, or 200 deg. scales.



INDUSTRIAL TYPE

Industrial Type Frequency Meters are also available in all sizes from 4" to 12" diameter dials with 90 deg. scales (approx).

Nalder Lipman Patents

N.C.S. PRODUCTS include all types of Measuring Instruments, Indicating or Recording, Switchboard or Portable. Also Protective Relays, Synchronisers, Circuit Breakers, Earth Leakage Trips, etc. Every unit is designed for maximum operating efficiency, reliability and durability, prices being competitive without sacrifice of quality.

Quotations on request.

NALDER BROS. & THOMPSON LTD.

Telephone : Clissold 2365 (3 lines) DALSTON LANE WORKS, LONDON, E.8 Telegrams : Occlude, Hack, London.

ELECTRIC FILTERS

by T. H. Turney, Ph.D., Research Dept., Automatic Telephone and Electric Co., Ltd. This is a simplified treatment of the four-terminal networks commonly used in telephone work, covering filters, attenuators, phase shifting net works and attenuation equalisers. It is recommended for all students preparing for the I.E.E. examinations.

25/- net

CONVEYORS AND CRANES

by W. H. Atherton, M.Sc., Wh.Ex., Roy.Ex. - - - 25/- net.

"This book certainly comes at an opportune time. There is a great demand for information on the subject which it so brilliantly covers"
—Mechanical Handling.

"This book very comprehensively covers the application of conveyors for the mechanical handling of commodities of various kinds."
Institute of Marine Engineers.

PITMAN BOOKS

39, Parker St., Kingsway, London, W.C.2.

For Profit and Perfect Satisfaction Stock and Sell Guaranteed Lines . . .

Bylock Vacuum Cleaners
Fluorescent Fittings. 4 Ft. 40 watt. 5 Ft. 80 Watt.
Ballast Units. Chokes. Static Condensers, etc.
Vent-Axia 6" 9" and 12" Extractor Units.
2 K.W. Insert Fires.
Quality Wood Blocks and Pattresses.

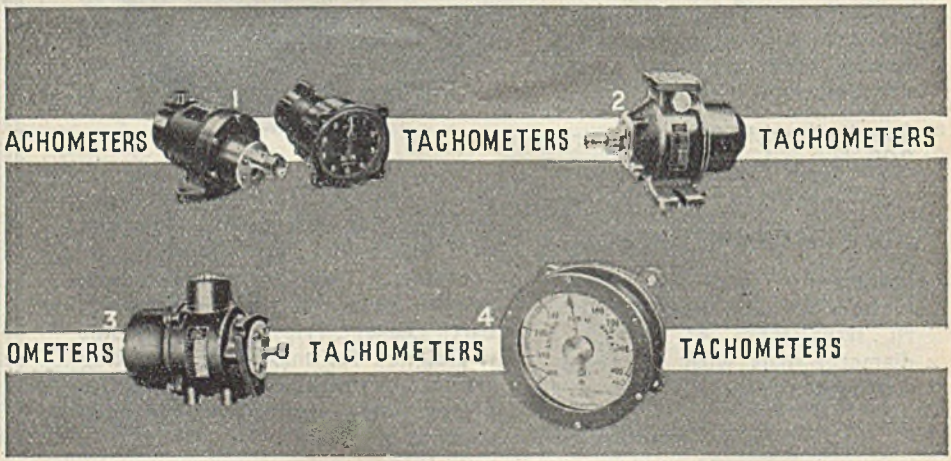
All factored from stock by

JACK HINTON
(ELECTRICAL) LTD.
17, CROWN STREET
BOLTON - LANCS

INSTRUMENT WIRES INSULATING MATERIALS

WEST INSULATING COMPANY LTD.,

2, Abbey Orchard Street, Westminster, London, S.W.1



1. Aircraft Type Indicator and Transmitter.
2. Water Tight Generator Transmitter.
3. General Purpose Generator Transmitter.
4. *Cirscale Engine Room Indicator.

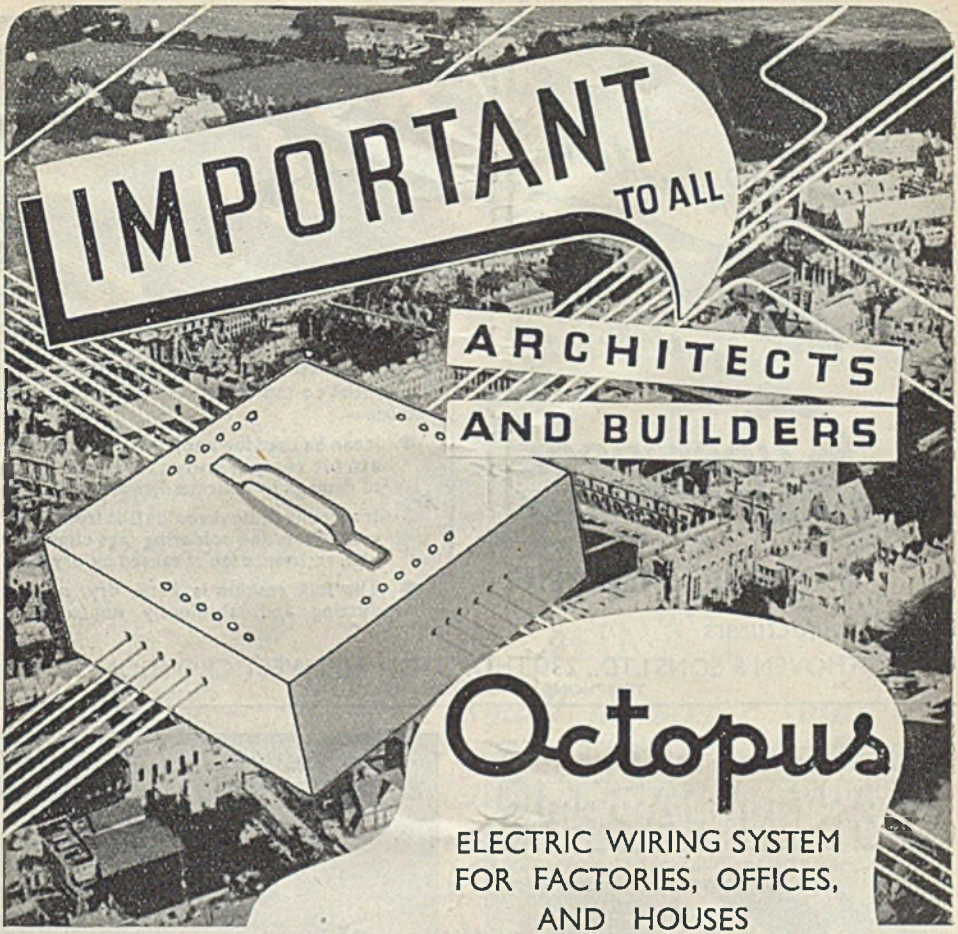
RECORD

Special Types available for Motor Buses and Trolley Buses, Rail Cars, Locomotives, etc.

** Cirscale is the Registered Trade Name of the Record Electrical Co. Ltd., and applies exclusively to their instruments.*

THE RECORD ELECTRICAL CO. LTD., BROADHEATH, ALTRINCHAM, CHESHIRE.

Tel.: Altrincham 3221/2. 'Grams.: "Infusion," Altrincham. London : 28, Victoria Street, S.W.1. Tel.: Abbey 5148.



APPLICABLE TO ANY SYSTEM OF BUILDING

Octopus ensures

1. Speedier and more efficient installation.
2. Considerable economy in labour and installation costs.

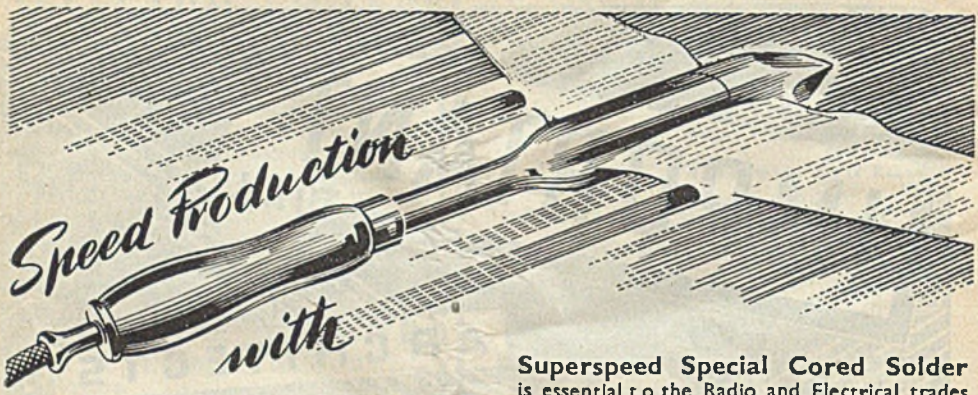
Octopus has been officially approved by governing authorities.

Write for illustrated brochure to

PROVED AND PRODUCING PROPERTIES LIMITED, 5, Cheapside, London, E.C.2, or

HARTLEY ELECTROMOTIVES, LTD., 57, Victoria St., London, S.W.1

Sole Agents for Northern Ireland: JAMES McCREEDY, LTD., Private Road, Cregagh, Belfast.



Superspeed SPECIAL

CORED SOLDER

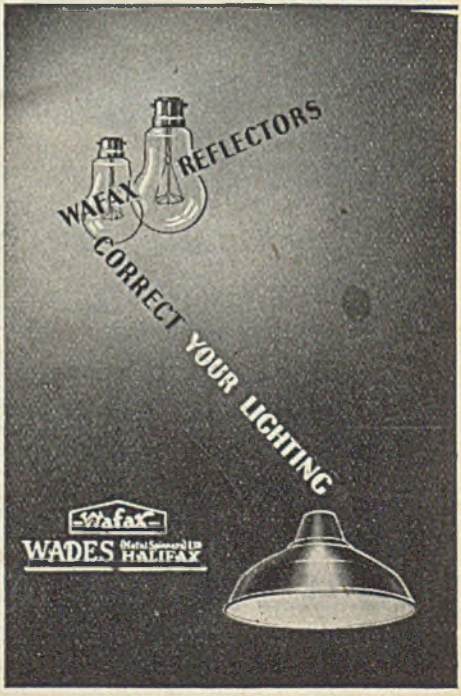
Superspeed Special Cored Solder is essential to the Radio and Electrical trades because—

- It can be used for **rapid work at moderate bit temperatures** thus reducing risk of damage to delicate components.
- It speedily removes oxide film from copper conductors and soldering tags eliminating high resistance faults caused by dry joints.
- The flux residue is hard, dry, non-conducting and absolutely non-corrosive.

Sole Manufacturers

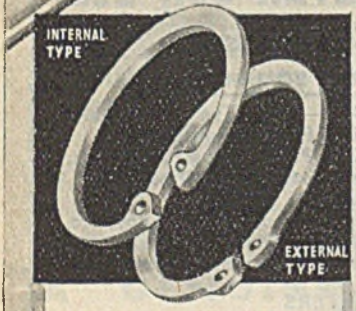
H. J. ENTHOVEN & SONS LTD., 230 THORNTON RD., WEST CROYDON, SURREY

TELEPHONE: THORNTON HEATH 2462.



TWICKLIPS

A SIMPLE AND EFFICIENT RETAINING DEVICE *for* *small diameter spindles*



Engineers who have felt the need for a really small circlip will welcome the Twicklip which fits in a groove just like a Seeger Circlip and which is made in sizes from 1/8 to 15/32.

SEEGER CIRCLIPS

FOR LARGE SHAFTS & BORES

The only circlip which always remains truly circular on the contact periphery. It exerts great and uniform pressure on the groove in which it is fitted and can be relied on as a completely safe fixture.

Write for descriptive literature

Manufactured by

The AUTOMOTIVE ENGINEERING Co. Ltd.
THE GREEN, TWICKENHAM, MIDDX.

PHONE POPESGROVE 2206 P.B.X

SAVES UP TO 15% FUEL

A Leonard-Thermostatic Steam and Water mixer provides hot water at controlled temperature for washing and process.

HOT WATER MADE ONLY WHERE WANTED—ONLY WHEN WANTED—COMPLETE CONTROL OUTFLOW TEMPERATURE—NO HEAT STORAGE AND RADIATION LOSSES—NO HOT WATER PIPE LINES—NO EXPENSIVE EQUIPMENT—EASY TO FIT—EASY TO CLEAN—EASY TO MAINTAIN—TAKES UP LITTLE MORE SPACE THAN AN ORDINARY STOP VALVE—THOUSANDS IN USE.

★ WRITE FOR PAMPHLET QUOTING REF.: 160/1857

Leonard-Thermostatic
STEAM & WATER MIXERS (PATENTED)

WALKER, CROSWELLER & CO. LTD
CHELTENHAM GLOS.

61.1857

VULCANIZED FIBRE.

EBONITE, BAKELITE

Sheets, Rods, Tubes and Machined Shapes

LEATHEROID Sheets, Rolls, etc.
"CLIFTEX" Insulating Tapes.
Insulating Staples, Jointing, Presspahn.

MOSSES & MITCHELL LTD.
60-68, Ironmonger Row, London, E.C.1.

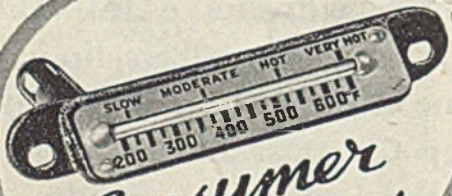
VERY USEFUL EX-GOVT. STEEL AMMUNITION BOXES . . . . . .

Size 21½" long, 9½" wide, 9½" deep. *Splendid for Tools, Packing, Stores, etc.*

7/6 each
"Ref. B.167"

Samples by post plus 1s./2d. each; in quantities the rate by rail is reasonable. Terms Nett cash with order, carriage extra. Many thousands available from stock. Immediate delivery. We have a large stock of steel boxes, various sizes, send for lists :— **WM. HURLOCK, JNR., LTD., High Street, - Thames Ditton, - Surrey.**

THE NOTTINGHAM THERMOMETER Co., Ltd.



to Consumer Engineers

We supply and repair thousands of Glass Cooker Thermometers.

Send your consignments of broken thermometers to:

MANUFACTURERS OF

PYROMETRIC EQUIPMENT

INDICATORS—Wall Type, Portable, Multi-point, Panel Mounting.
THERMO-COUPLES—Base & Rare Metals.
RESISTANCE THERMOMETERS.
COMPENSATING CABLES.
SHEATHS—Refractory, Steel, Alloy, etc.
SPARES—Wires, Elements, Insulators, Thermo-Couple Heads, etc., etc.

THERMOMETERS

GLASS STEM DIVIDED—Ranges up to 550° C. or 1,000° F.
GLASS IN VARIOUS METAL FITTINGS—Pipe Type, Jam, Varnish, Molten Metal, Quenching Bath, Bakers, Dyers, Flue Gas, etc.
DIAL VAPOUR PRESSURE — Flexible Capillary and Rigid Stem Patterns, etc.

63, MANSFIELD ROAD - NOTTINGHAM, ENGLAND
'Phone: 45815

POWER TRANSFORMERS

10va/20 KVA
S.P., 3 phase
Chokes, Soil and Space Heaters
by The Transformer & Electrical Co. Ltd.
Eastern Works, Eastern Road, Walthamstow, E.17
Tel.: Keystone 5031-2

Coil Winding — Rewinds — & Repairs

BARLECTA
P.V.C.
CABLES AND FLEXIBLES

1/044 to 19/064
Single - Double
Triple.

14/0076 to 162/0076
One, Two, Three
and Four core.

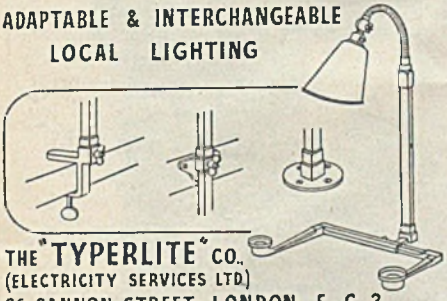
Write for
LIST No. 1547/E.

MADE IN ENGLAND.

Competitive Prices.

BARRIES
ELECTRICAL AGENCIES LTD.,
King Street, Brighton 1, Sussex.
Telephone: Brighton 8366 (7 lines) P.B.X.

ADAPTABLE & INTERCHANGEABLE
LOCAL LIGHTING



THE "TYPERLITE" CO.
(ELECTRICITY SERVICES LTD.)
86 CANNON STREET . LONDON . E . C . 3.

WALTER CRANE
REPAIRS AND REWINDS
We specialise in the re-winding of all types of electrical equipment including portable tools, vacuum cleaners, etc.

Trade List on application.

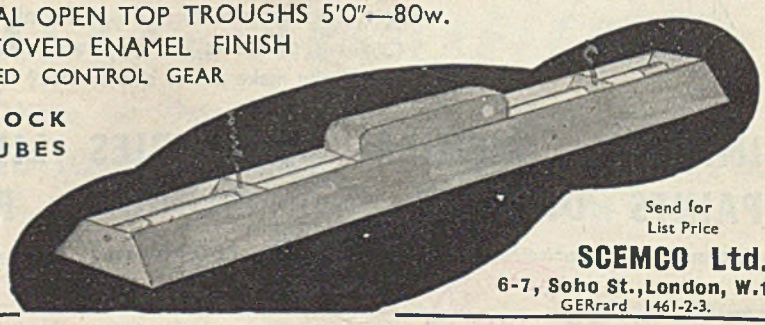
WALTER CRANE, Greencoat Works, Wakefield.

PRESS TOOLS FOR MICA

H. J. COBB AND SON
35 SOUTH PARK RD., WIMBLEDON, S.W.19

A GENUINE VALUE OPPORTUNITY
INDUSTRIAL OPEN TOP TROUGHS 5'0"—80w.
ULTRA STOVED ENAMEL FINISH
STREAMLINED CONTROL GEAR

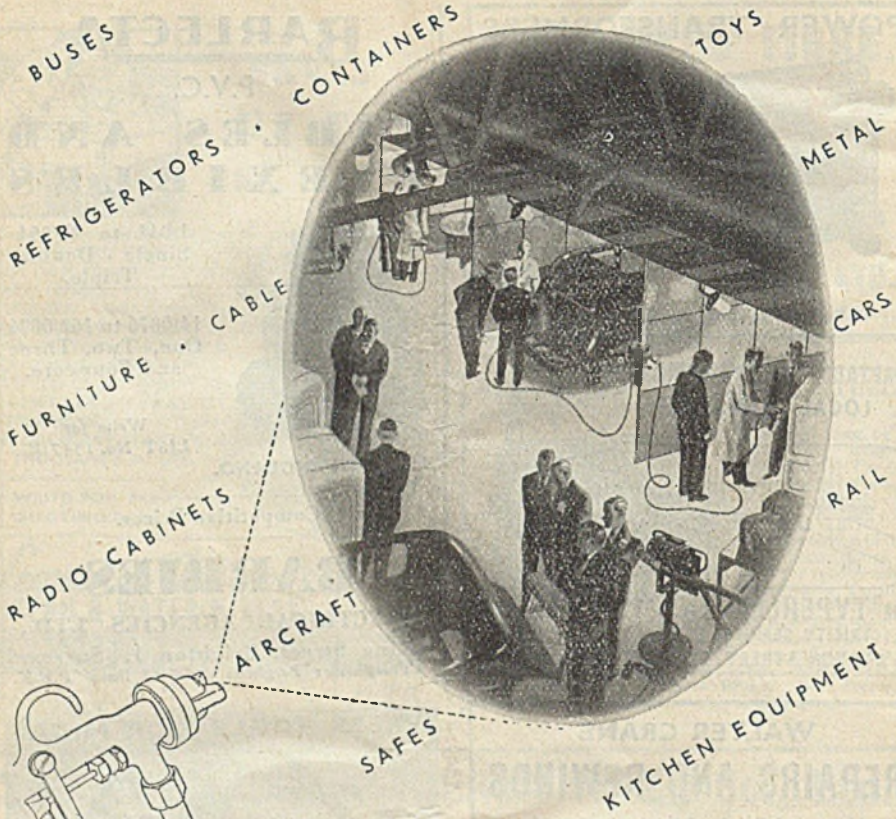
FROM STOCK
WITH TUBES



See "SCEMCO AGENCIES" announcement under business opportunities.

Send for List Price

SCEMCO Ltd.
6-7, Soho St., London, W.1
GERrard 1461-2-3.



OUT OF THE SPRAY GUN comes the paint or lacquer which will decide the final finish of the product: its appearance, its durability—and in many cases, its reputation.

Because the finish is so important a factor, I.C.I. Paints Division maintain a Technical Service Station where the industrial paint user can see for himself how best results may be achieved with existing finishes, and learn the possibilities of new finishes and finishing processes as they are developed. Could you make use of this service?

IMPERIAL CHEMICAL INDUSTRIES LIMITED

PAINTS DIVISION ICI **SLOUGH, BUCKS**

(successors to Nobel Chemical Finishes Ltd.)

Telephone: Slough 23851

D.1.739

POLITECHNIKA ŚLĄSKA BIBLIOTEKA GŁÓWNA

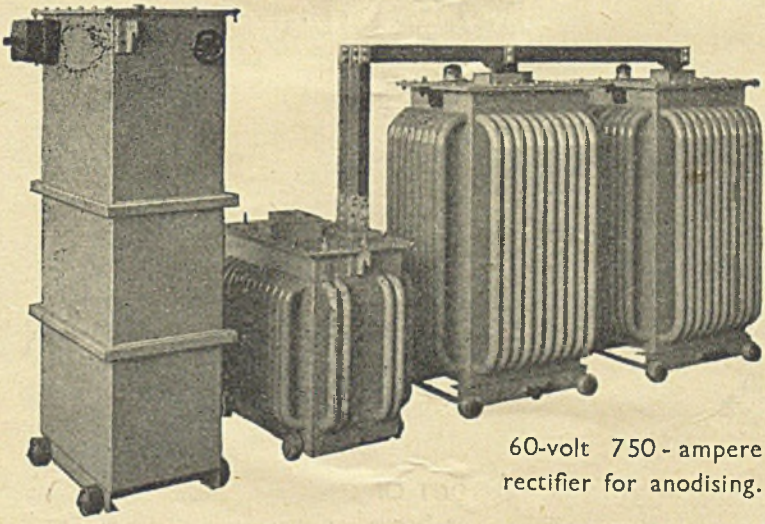
Power

for

chromic-acid anodising

&

allied processes



60-volt 750-ampere rectifier for anodising.

Overall efficiency of 85–90% from A.C. mains to bath

WESTINGHOUSE

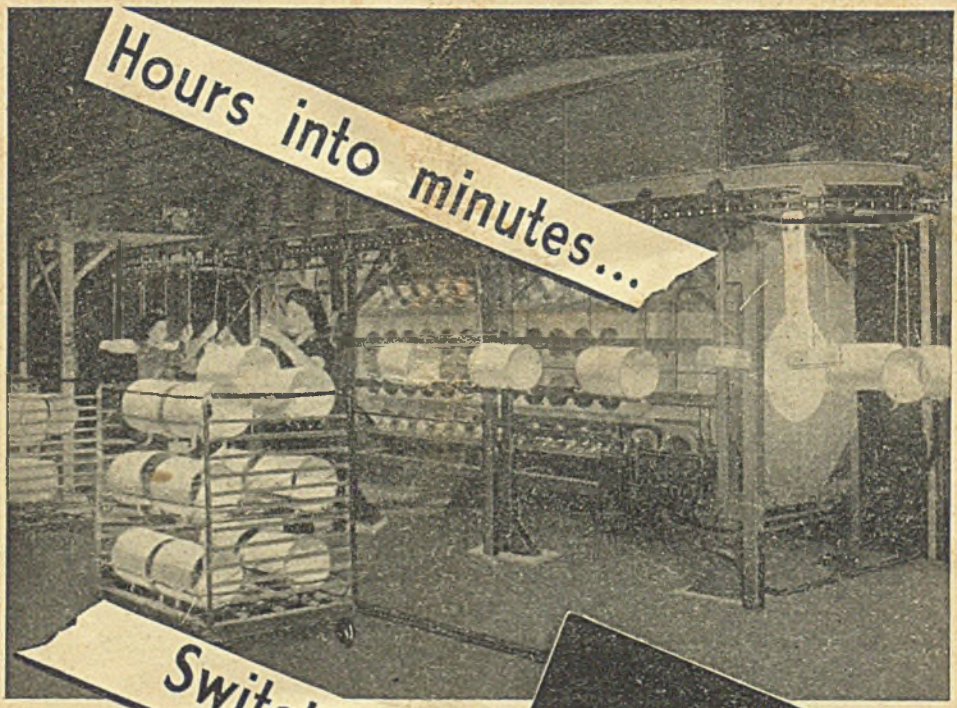
WESTALITE

METAL RECTIFIERS

Write for Data Sheet No. 44 to Dept. E.

WESTINGHOUSE BRAKE & SIGNAL CO. LTD.,

82, York Way, King's Cross, London, N.1



Switch to

METROVICK INFRA-RED

PAINT STOVING

A Metrovick Electric Infra Red oven stoving paint on outer cases of water heaters, ranging from 1½ to 30 gallons capacity, in 5-6 minutes.

The plant is equipped with 96 Metrovick Infra Red lamps, having a total loading of 24 kW.

In addition to its ability to reduce vital production time this oven requires a floor space of only 12ft. x 4ft. x 11ft. high.

Metrovick equipments are readily adaptable to various production and factory requirements.

Executives are invited to visit our London Demonstration Department

Photograph by courtesy of Messrs. Johnson & Phillips Ltd.

S/1701

METROPOLITAN-VICKERS ELECTRICAL CO. LTD · NUMBER ONE KINGSWAY · LONDON · W.C.2

Printed in Great Britain by STRAKER BROTHERS LTD., 194-200, Bishopsgate, E.C.2, and published by BENN BROTHERS, LTD., at Bouverie House, 154, Fleet Street, London, E.C.4. (Registered at the General Post Office. Entered as Second Class at the New York, U.S.A., Post Office.)—Friday, July 18 1947.